Science in Samskrit

Samskrita Bharati

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Science in Samskrit - A glimpse into scientific heritage of India.
Pages-152

PREFACE

Samskrit is not just a language. It is the voice of Bharat's (India's) soul and wisdom. It is the fountainhead of our national life spring. It is the link between our past and present. Samskrit is the language of the Knowledge Tradition of Bharat.

Samskrit language and literature is a great repository of knowledge encompassing every walk of life, be it science and technology, agriculture and sculpture, astronomy and architecture, medicine and metallurgy, mathematics and management, economics and ecology. This book is a humble attempt to give the reader a glimpse into the rich and vast scientific heritage of Bharat hidden in the treasure-house called Samskrit.

Samskrit was the medium of communication, education, law, administration, trade, commerce, art, entertainment, research and of all modes of intellectual debates till a few centuries ago. It was the link language of Bharat. Reviving it again is only a matter of our collective will and time.

Learning Samskrit is not learning a new language. Most Bharatiya languages have more than sixty percent Samskrit words. Samskrit being the cultural language of Bharat from time immemorial, it flows in the very blood of every Bharatiya. The teaching method of Samskrit, called Grammar-Translation-Method, employed in schools and colleges for the last 150 years and which continues even today, is an age old foreign method which made Samskrit learning difficult. Now that Samskrita Bharati has developed new methods of Samskrit teaching, learning Samskrit has become very easy.

In today's globalised economy and in the context of knowledge society, we need Samskrit more than ever before, to preserve our moorings, to bridge the ancient and the modern, to unravel the knowledge contained in the ancient texts, to protect our Intellectual Property Rights, to explore new avenues of innovations and to lead Bharat into the forefront of the future Knowledge-driven-globe.

— ***The Publishers***

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- Be a volunteer of Samskrita Bharati. Contact your nearest Samskrita Bharati volunteer or samskritabharatidelhi@yahoo.co.in. Tel: 011-2351 7689

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ASTRONOMY

Solar Energy

येनेमा विश्वा भुवनानि तस्थुः ।
ततः क्षत्रं बलमोजश्च जातम् ॥
(Taittiriya Aranyakam-3.11)

The world is due to the Sun god. The living beings get their strength and energy from Him.

The fact that sun is the source of energy was well known to Indians from Vedic period.

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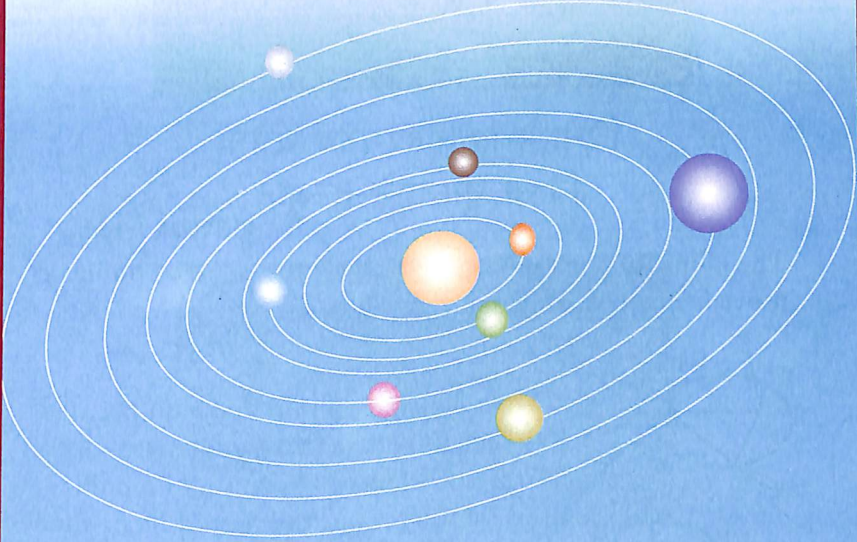
ASTRONOMY

Sun- The centre of solar system

मित्रो दाधार पृथिवीमुतद्याम् । मित्रः कृष्टीः ।

THYTHIRIYASAMHITA3.4.10.3-4 तैत्तिरीयसंहिता ३.४.१०.३-४

The sun holds the earth and the celestial region.

The sun is the attracting power of all heavenly bodies

An instance of Bharatiya culture always being knowledge-centred!

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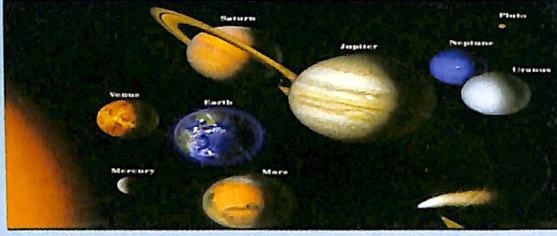
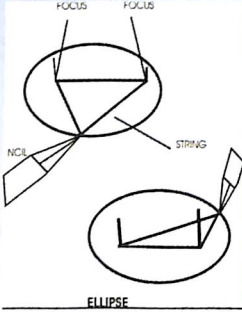
Path Of all Celestial Bodies Is Elliptical

त्रिनाभिचक्रमजरमनर्वं यत्रेमा
विश्वा भुवनानि तस्थुः।

RIGVEDA 1.164.2

The elliptical path through which all the celestial bodies move is imperishable and unslakened.

This is called Trinabhichakram because to form an ellipse three points are required. Ellipse is the path of a point that moves so that the sum of its distances from two fixed points called foci is constant.

[In the western astronomical tradition upto the age of Copernicus (1473-1543), it was believed that the planets and other celestial bodies had circular orbits.Later Johannes Kepler proposed a new theory in 1609. According to him the path of all the planets and other celestial bodies is elliptial.]

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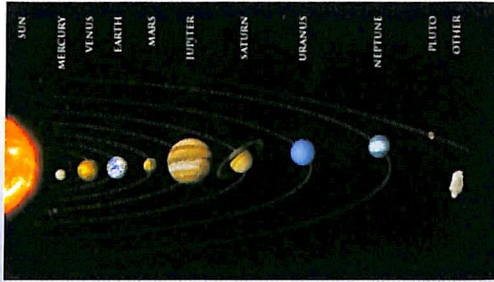
PLANETARY MOTION

कक्ष्या प्रतिमण्डलगा भ्रमन्ति सर्वे ग्रहाः स्वचारेण।
मन्दोच्चादनुलोमं प्रतिलोमञ्चैव शीघ्रोच्चात्।।

आर्यभटीयम्- कलाक्रियापादः ३.१७(४९९ क्क)
ARYABHATEEYAM-KALAKRIYAPADA-3.17.(499AD)

The mean planets move on their orbits and the true planets in eccentric circles. All the planets whether moving on their orbits or in eccentric circles move with their own motion, anti-clockwise from their apogees and clock-wise from their perigees.

[Aryabhata stated this law in the 5th century AD, much before the first law of planetary motion given by Johannes Keppler in 17th century AD.]

Break free from the orbit of the west!

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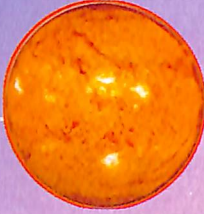
ASTRONOMY

CAUSE OF ECLIPSE

छादयति शशी सूर्यं शशिनं महती च भूच्छाया।।

(ARYABHATIYAM-GOLAPAADAH 37)-499 CE

THE MOON COVERS THE SUN AND THE GREAT SHADOW OF THE EARTH COVERS THE MOON

THAT ARYABHATA DEMYSTIFIED ECLIPSE AEONS AGO, STANDS ECLIPSED BY MISPLACED CREDITS!

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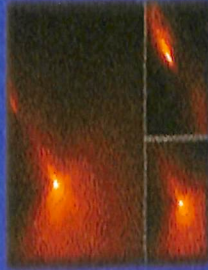
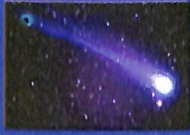
Seasons when comets influence the Earth

तेषां विद्युत्सम्मोहस्तु
शरद्वासन्तयोः क्रमात् ।
भवन्त्यादित्यकिरणे-
ष्वन्तर्भूताः स्वभावतः ।।

Brihad-vimana-shastram,
Kriyasara-tantram page 185

The influence of these comets is increased rapidly in the seasons of autumn and spring as these naturally and inherently exists in the solar rays.

WHAT A HELL LOT OF KNOWLEDGE ABOUT HEAVENLY BODIES!

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ASTRONOMY

NUMBER OF COMETS

बाणास्थधूमकेतूनां मण्डलस्याष्टमान्तरे ।
त्रिकोटिसप्तलक्षत्रिसहस्राद्विशतोपरि ।।
एकविंशतिसङ्ख्याकाः वर्तन्ते धूमकेतवः ।।

(Brihad Vimana Shastra - Kriyasara-tantra page 184)

IN THE EIGHTH REGION OF THE SKY THERE ARE
3,07,03,221 COMETS.

विद्युद्गर्भास्तेषु धूमकेतवोऽष्टसहस्रकाः ।
महाकालादयो रौद्राः विद्युद्द्वादशलोचनाः ।।
तेषु द्वादशसङ्ख्याकाः प्रशस्ताः धूमकेतवः ।।

BRIHAD VIMANA SHASTRA - KRIYASARA TANTRA PAGE 184

AMONG THE ABOVE COMETS 8000 ARE
VERY FIERCE.
TWELVE OUT OF THESE EIGHT
THOUSAND ARE AGAIN HIGHLY POWERFUL.

THE POWER OF BHARATIYA KNOWLEDGE !

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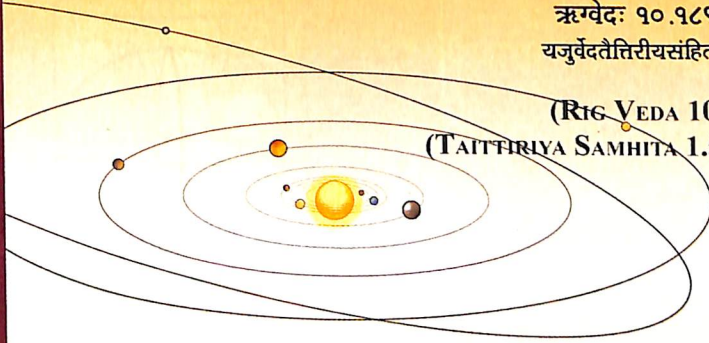
ASTRONOMY

THE MOON--

the satellite
of the earth

आयं गौः पृश्निरक्रमीत् असदन्मातरं पुरः।
पितरं च प्रयन्त्स्वः।

ऋग्वेदः १०.१८९.१,
यजुर्वेदतैत्तिरीयसंहिता १.५.१.३-४

(Rig Veda 10.189.1)
(Taittiriya Samhita 1.5.1.3, 4)

The Moon, being the satellite of the earth, revolves round its mother planet and follows it in its revolution round the self-luminous father planet (the Sun).

There are in all thirty two satellites in the Solar System. The Moon is the only satellite of the Earth with a distinct nature, while all other satellites have sizes below 1/8th size of their mother planet, the earth. Therefore this is the only satellite in the solar system which is very big.

This is one bright example of Indian astronomical genius in the Vedic era (approx. 8000 years ago).

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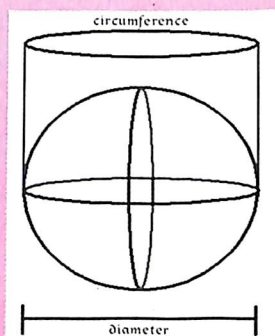
ASTRONOMY

Circumference Of The Earth

योजनानि शतान्यष्टौ
भूकर्णौ द्विगुणानि च।
तद्वद्गर्तो दशगुणात्
पदं भूपरिधिर्भवेत्।।

suryasidhanth
madhyamadhikarah-59

The radius of the earth is 800 yojanas. The circumference of the earth is the result of multiplication of its radius with 2 and square root of 1024056 or 326×10^7 danda.

The value for the circumference of the earth is 4.008×10^7 meters.
(One danda is equal to 1.24 meters approximately)

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ASTRONOMY

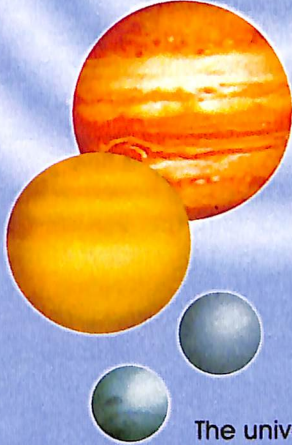
ORBITING PLANETS ---

concepts of gravitation

आकृष्टिशक्तिश्च मही तया खस्थं
गुरु स्वाभिमुखं स्वशक्त्या।
आकृष्यते तत्पततीव भाति समे
समन्तात् क्व पतत्वियं खे।।

सिद्धान्तशिरोमणि-भुवनकोशः-६
528CE

Massive celestial bodies are attracted powerfully towards theearth by her own (gravitational) force, and they appear to fall as a result of such attraction, but when equal forces act on a body in space from all sides how can it fall?

(Siddhanta-shiromani - Bhuvanakosha - 6)
(528 AD)

The universal law of gravitation was propounded by Issac Newton (1642-1727 CE) much later.

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ASTRONOMY

NADIVALAYA YANTRAM

अपवृत्ते कुजलग्ने लग्नं चाथो खगोलनलिकान्तः।
भूरथं ध्रुवयष्टिस्थं चक्रं षष्टा निजोदयैचाङ्कयम्।
व्यस्तैर्यष्टी भायामुदयेऽर्कन्यस्य नाडिका ज्ञेयाः।
इष्टच्छायासूर्यान्तरेऽथ लग्नं प्रभायां च।।
केनचिदाधारेण ध्रुवाभिमुखकीलकेऽत्र धृते।
अथ कीलच्छायातलमध्ये स्युर्नता नाडः।।

सिद्धान्ताशिरोमणि -यन्त्राध्यायः-५
SIDHANTHASIROMANI -YANTRADYAYAH-4

This is a simple astronomical instrument of Hindu origin commonly used by ancient astronomers. Bhaskaracharya describes his Nadivalayam as a circle of wood circumferences of which was graduated into Ghatis and its subdivisions. This dial is placed in the plane of equator and the vertical gnomon is fixed at it center. The shadow of the gnomon is taken into account to determine local time and hemispherical positions of the planets. This is also known as Dhupaghadi.

Indians fomenting the celestial calculations devised various astronomical instruments.

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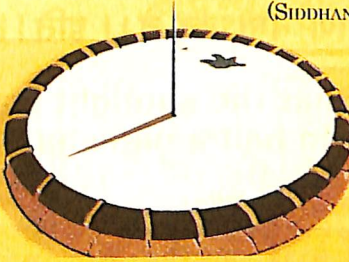
ASTRONOMY

Astronomical Instruments of Ancient India

SHANKU YANTRAM

समतलमस्तकपरिधिर्भ्रमसिद्धो दन्तिदन्तजः शङ्कुः ।
तच्छायातः प्रोक्तं ज्ञानं दिग्देशकालानाम् ।।

सिद्धान्तशिरोमणि - यन्त्राध्यायः-९

(Siddhanta-shiromani - Yantradhyaya - 9)
(528 AD)

This instrument, made of ivory consists of a circular platform on the horizontal plane with Shanku (post) at the centre. This is used to trace the sun's path and also to know several facts of astronomy.

ELEPHANTINE CALCULATIONS WITH IVORY-FINE DEVICES ! TRULY FINE INDEED!!

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SPEED OF LIGHT

तरणिर्विश्वदर्शतो ज्योतिष्कुदसि सूर्य ।
विश्वमाभासि रोचनम्

(Rik-samhita - 1.50.4)

The Sun quickly pervades the whole world. Sayanacharya (a celebrated saint) comments on the above text

तथा च स्मर्यते योजनानां सहस्त्रं द्वे द्वे शते द्वे च योजने ।
एकेन निमिषार्धेन क्रममाण नमोऽस्तु ते ।। इति ।।

"It is remembered that the sunlight travels 2,202 yojanas in half a nimisha."

1yojana = 9 miles,
110 yards = 9.6025 miles
2,202 yojanas = 21,144.705miles
Time taken = 1/2 nimisha = 1/8.75 = 0.114286 seconds
Thus speed of light = 1,85,016.169 miles/sec.
Modern value = 1,86,000 miles/ second.
[Michaelson & Morley discovered the velocity of light in the 19th century AD.]

WHAT AN INSIGHT TO GIVE THE SPEED OF LIGHT!!

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Origin Of Matter

तस्माद् वा एतस्मादात्मन आकाशः सम्भूतः।

आकाशात् वायुः ।

वायोः अग्निः ।

अग्नेः आपः ।

अद्भ्यः पृथिवी।।

(Taittiriya Upanishad, Brahmananda-valli, anuvaka 1)

From That (Absolute cause) space came, from which wind came, from wind fire came, from fire water came, from water earth came.

The sequence of the creation of matter is Akasha, Vayu, Agni, Apa, Prithvi.

[Modern physics gives this sequence as ***plasma, gas, energy, liquid, and solid***. It also states the interconvertability of matter and energy.]

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PHYSICS

कारणाभावात् कार्याभावः ।
न तु कार्याभावात् कारणाभावः ।।

Vaiseshikadarshanam 1.2

There is no effect possible without a cause. But the absence of effect does not mean the absence of cause.
The text also substantiates the above fact with an example: Applying a force (less than needed to overcome friction) will not make a body move. In this case, the cause (the force) is present but not the effect (motion).

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Varieties Of Magnets

भ्रामकं चुम्बकं चैव कर्षकं द्रावकं तथा।
एवं चतुर्विधं कान्तं रोमकान्तं च पञ्चमम्।।
एकद्वित्रिचतुः पञ्चसर्वतोमुखमेवतत्।
पीतं कृष्णं तथा रक्तं त्रिवर्ण स्यात् पृथक् पृथक्।।

(Rasarnava, Patala 6, 40,41)
(12th century AD)

Magnets are of 5 basic varieties

- Bhramakam
- Chumbakam
- Karshakam
- Dravakam
- Romakam

These 5 have 6 sub varieties

- Single faced
- Two faced
- Three faced
- Four faced
- Five faced
- Multi faced

The above 30 is in 3 colours

- Yellow
- Red
- Black

Magnets are categorised in 90 varieties.

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UNITS AND MEASUREMENTS

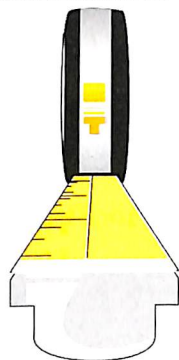
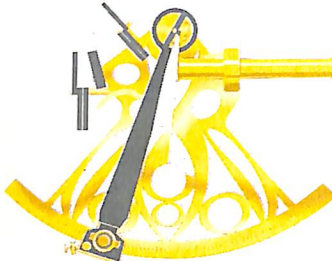
Physics is a quantitative science. Its method often involves measurements. This requires defining 'standards' and then expressing interrelations between the various quantities. Historically there existed many different systems of units in different countries over the world. The most popular among those used in scientific works were, a) F.P.S system used in Briton and b) the C.G.S and its practical variation, the M.K.S systems used in France.

Indian scientists too had evolved a unit system,. Given below is the scheme for length measurement used in Ancient India, in connection with construction of buildings, religious altars, etc.

The fundamental unit of length is called "paramanu", which is defined as "the sixtieth part of the smallest particle seen in sunlight entering (a room) through a window"

In modern science, seeing micro size dust particle present in a room illuminate by sunlight , by the process of scattering is known as Tyndall Effect.

The length Scale based on paramanu:-

8paramanu = 1 Trasarenu
8Trsarenu = 1Renu
8Renu = 1Balagra
8balagra = 1Likhya
8Likhya = 1Yuka
8Yuka = 1Yava
8Yava = 1Angula
24angula = 1Hastha
4Hastha = 1Danda
2000danda =1 Krosa
4Krosa = 1Yojana

The Radius of the earth = 800 Yojanas.The circumference of the earth is calculated by multiplying the radius by 10 . Thus comparing the modern values we can find that

1Danda = 1metre, approximately. Further, 1Pramanu = 50 Angstroms, approximately, which is of the order of molecular dimensions.

It may appear surprising that the figures given for the circumference of the earth in the Rigveda and the Suryasidhantha are the same.

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ELECTRICITY

संस्थाप्य मृण्मयं पात्रं ताम्रपत्रं सुसंस्कृतम्।

छादयेत् शिखिग्रीवेन चार्द्राभिः काष्टपांसुभिः ।।

दस्तालोष्टो निधात्वः पारदाच्छादितस्ततः।

उत्पादयति तन्मित्रं संयोगस्ताम्रदस्तयोः।।

संयोगाज्जायते तेजो यन्मित्रमिति कथ्यते।

एवं शतानां कुम्भानां संयोगः कार्यकृत् स्मृतः।

सुसंमृष्टा च सुभगा घृतयोनिः पयोधरा।

मृत्कुम्भी सर्वदा ग्राह्या ....

अगस्त्यसंहिता (14thC.E.)

(Agastya Samhita)
(14th century AD)

This sloka deals with generation of electrical energy using copper plates and chemicals kept in hundreds of earthen pots to make a battery bank.

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RAINBOW

सूर्यस्य विवधवर्णाः पवनेन
विघट्टिताः कराः साभ्रे ।
वियति धनुः संस्थानाः
ये दृश्यन्ते तदिन्द्रधनुः ।।

Bruhatsamhita-chapter 35
(6th century CE)

The multi coloured rays of the Sun, being dispersed in a cloudy sky, are seen in the form of a bow, which is called the Rainbow.

7 colours in white light

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PHYSICS

MOTION

१ संयोग-विभाग-वेगानां कर्म समानम्।

(वैशेषिकदर्शनम् -१.१.२०)

२ गुरुत्व-प्रयत्न-संयोगानाम् उत्क्षेपणम्

(वैशेषिकदर्शनम् -१.१.२१)

३ मणिगमनं सूच्याभिसर्पणम् अदृष्टकरणम्

(वैशेषिकदर्शनम् -५.१.२५)

(Vaisheshika darshanam -1.1.20; 1.1.21; 5.1.25)

1. Motion is the cause of conjunction, disjunction, and velocity.

2. Motion against gravity is due to effort and conjunction is the effect.

3. Motion of precious stones and compass needle is due to invisible cause.

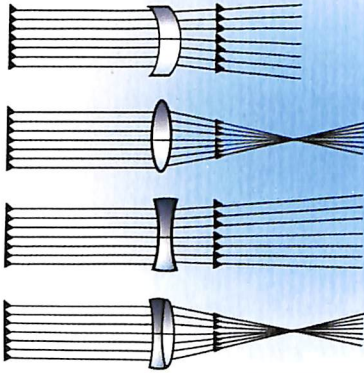
OUR SEERS OBSERVED VARIOUS PHYSICAL LAWS.

PHYSICS

LENS

।। अप्राप्यग्रहणं काचाभ्रपटलस्फटिकान्तरितोपलब्धेः ।।

न्यायदर्शनम् अ. ३.४६
800 BCE

That which cannot be perceived with nake eye can be perceived with the help of instruments with lenses made of Kacha (glass), Abhrapatala (Mica) and Sphatika (crystal).

Roger Bacon's (C.E.1214 to 1292) another invention was lens. A lens is a piece of glass or other transparent substance with two curved surfaces, or one plain surface and one curved surface bringing together or spreading rays of light passing through it.

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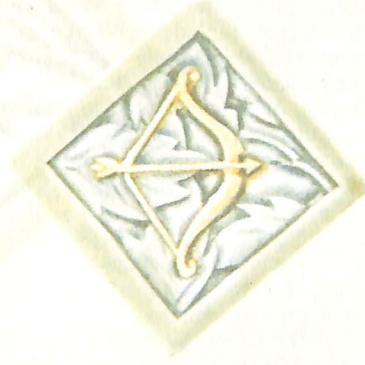
ELASTICITY

ये घना निबिडाः अवयवसन्निवेशाः तैः विशिष्टेषु स्पर्शवत्सु।
द्रव्येषु वर्तमानः स्थितिस्थापकः स्वाश्रयमन्यथा कृतमवनामितम्
यथावत्स्थापयति पूर्ववदृजुः करोति।

न्यायकन्दली

(Nyayakandali)

Sthithisthapakata (elasticity) is a property by virtue of which bodies resist deformation force applied on them. This propertyhelps them to regain its original state

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HISTORY OF PHYSICS : INDIA'S ROLE AND STATUS

PHYSICS tries to understand natural phenomena and the basic laws of working of the nature through observations, experiments and formulating mathematical theories. The method is due to Galileo [Italy, 1564 - 1642] and Newton [England, 1642 - 1727]. Newton's book, Philosophia Naturalis Principia Mathematica, (Meaning: mathematical principles of natural philosophy, published in 1687) forms the foundation of Physics, known as Natural Philosophy. The principles enunciated are still used with little modification in the exploration of the Macroscopic World.

By the end of the 19^{th} century several experimental as well as theoretical situations arose,.which seemed to contradict the Newtonian Formulation. Then came Einstein's Theory of Relativity (The Spl. theory, in 1905 and the Gen. theory in 1915) for objects moving at speeds of the order of light, and The Quantum Mechanics (by Heisenberg, Schrodinger, Max born, Pauli and others) for energies or masses at the level of the elementary particles such as Electrons, Protons and Mesons. While Einstein's Theory completely revolutionized our understanding of the basic laws of Physics, The Quantum Mechanics created a new mathematical formalism to explore the sub-atomic world.

Prior to Galileo, the tool of investigation was the sharpness of intelligence and vision. The great minds involved in such activities were known as Philosophers and Thinkers. In this early age of scientific thought the sages of India occupy a leading position.

Among the materialistic philosophers of India stands out the name of Kanaada, who was the proponent of the Vaisheshika school of thought.

Knowledge of the various aspects of the physical world lie scattered in many Sanskrit works such as the Vedas, Vedangas, Puranas, etc. The six darsanas, viz., Nyaya of Gautama, Vasheshika of Kanaada, Saankhya of Kapila, Yoga of Patanjali, Purva-mimamsa of Jamini and Uttara-mimamsa of Vyasa deal with several aspects of the animate and inanimate world.

The ancient Indians had a holistic view of the entire world. Some of the observations can be better correlated to 20^{th} century physical concepts.

Mr. Capra refers to the Mundakopanishad and quotes David Bohm: " One is lead to a new notion of unbroken wholeness which denies the classical idea of analyzability of the world into separately and independently existing parts...we have reversed the usual Classical notion that the independent elementary parts of the world are the fundamental reality, and that the various systems are merely particular contingent forms and arrangements of these parts. Rather, we say that the inseparable quantum interconnections of the whole universe is the fundamental reality and that relatively independently behaving parts are merely particular and contingent forms within the whole."

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ENGINEERING

'MACHINE' DEFINED

दण्डैश्चक्रैश्च दन्तैश्च सरणिभ्रमणादिभिः।
शक्तेरुत्पादनं किं वा चालनं यन्त्रमुच्यते।।

Yantrarnavam
(14th century AD)

SYSTEM FOR GENERATION OF ENERGY THROUGH MOTION OR CONTINIOUS ROTATION OF SHAFTS, WHEELS OR WEDGES IS CALLED A MACHINE

WHAT A MACHINERY OF HUMAN MIND - OF OUR FOREFATHERS'.

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TYPES OF TRANSPORT

जले नौकेव यानं स्याद्
भूमियानं रथं स्मृतम् ।
आकाशे अग्नियानं च
व्योमयानं तदेव हि ।।

(Bhrigu Samhita, verse 2)
(6th century AD)

Ships ply on water, vehicles moving on the ground are chariots.
Those moving in the sky are space-vehicles propelled by fire.

Want to get transported to Ancient Wisdom? Here it is!!

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SHIPS

न सिन्धु गाद्यार्हति लोहबन्धनं
तल्लोहकान्तैः ह्रियते हि लोहम्।
विपद्यन्ते तेन जलेषु नौकाः
गुणेन बन्धं निजगाद भोजः।।

(YUKTIKALPATARU, VERSE 88)

BHOJA SAYS THAT NO IRON SHOULD BE USED IN JOINING THE PLANKS IN THE BOTTOM OF A SHIP. THIS EXPOSES THE SHIP TO THE INFLUENCE OF MAGNETIC ROCKS IN THE SEA AND BRINGS IT WITHIN THE MAGNETIC FIELD, CAUSING IT TO SINK.

OCEAN GIVES WAY TO BHARAT'S ENGINEERS OF YORE!
OUR EXCELLENCE WAS SHIP-SHAPE LONG LONG BEFORE!!

TYPES OF ALLOY

अथ नामानि। उष्मंभर-उष्मपा-उष्महनो राजाम्लतृड्वीरहा
पञ्चघ्नोऽग्नितृड्भारहनश्शीतहनो गरलघ्नाम्लहनो
विषम्भर विशल्यकृत् विजमित्रो वातमित्रश्चेति।

VIMANASASTRAM -BHARADWAJMUNI

THERE ARE 16 TYPES OF ALLOYS FOR THE CONSTRUCTION OF AIRPLANES MADE WITH THE HELP OF THREE METALS :

(SAUMAKA, SAUNDALIKA AND MAURTVIKA)

THE ALLOYS ARE:

1. USMAMBHARA
2. USHNAPA
3. USHMANAHA
4. RAJA
5. AMLATRT
6. VIRAHA
7. PANCHAGHNA
8. AGNITRT
9. BHARAHANA
10. SHITAHANA
11. GARALAGHNA
12. AMLAHANA
13. VISHAMBHARA
14. VISHALYAKRT
15. VIJAMITRA
16. VATAMITRA

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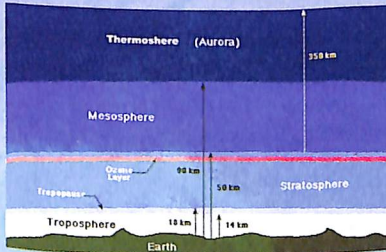
PROTECTION OF AIRCRAFTS

आकाशपञ्चमे कक्ष्ये विमानः सञ्चरेद्यदि।
क्षत्रकोलाहलज्वाला वेगात् भस्मीकृतं भवेत्।।
तस्मात् तत्परिहाराय रौद्रीदर्पणयन्त्रकम्।।

(VIMANASHASTRAM, YANTRADHIKARANAM 50, 51)

IF THE AIRCRAFT ENTERS INTO THE FIFTH LAYER OF THE ATMOSPHERE, DUE TO STRONG EDDIES IT MAY BE DAMAGED. THE CONTRIVANCE CALLED ROUDRI DARPANA YANTRAM OFFERS THE REQUIRED PROTECTION.

THE FIFTH LAYER OF THE ATMOSPHERE CORRESPONDS TO A LAYER CALLED GHARSHANAVARTHA OR THERMOSPHERE. THIS LAYER IS SUPPOSED TO HAVE A LARGE PROPORTION OF OZONE AND IS LARGELY RESPONSIBLE FOR ABSORPTION OF ULTRA VIOLET RAYS.

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Manufacture of fabric was provided in book Pata-kalpa

रक्तकृष्णश्वेतनीलपीतवर्णादिभिः क्रमात्।
रञ्जितं पटमेकं तु कुर्यात् शास्त्रविधानतः।
मुञ्जारक्तकल्याणगोमरशम्बरः तथा।
शणराजावर्ततृणक्रव्याद्येन शास्त्र...।
विमानं चोदयेत् प्राज्ञः नानागति प्रभेदतः।
विमानरक्षणं तेन प्रभवेत् नात्र संशयः।
तस्मादेतत् यन्त्रमुक्तं समासेन यथाविधि।।

A coloured sheet of fabric may be prepared systematically, having colours red, black, white, blue, yellow, etc. using various materials like munja, aarakta, gomara, shambara, etc. These can help in propelling the aircraft to various speeds and also used in the protection of the aircraft.

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STAMBHANAYANTRAM

वातप्रवाहसंसर्गपरिहाराय केवलम्।
विमानस्तम्भनयन्त्रं यथामति निरूप्यते।।
चतुरश्रं वर्तुलं वा वक्रतुण्डाख्यलोहतः।
विमानपीठभ्रमणे चतुर्थांशप्रमाणतः।।
घने विनास्ति त्रितयं पीठं अन्यत् प्रकल्पयेत्।
ईशान्यादि क्रमात् तस्मिन् अष्टदिक्षु यथाक्रमम्।।
केन्द्राणि विधिवत् कुर्यात् सच्छिद्रावरणं यथा।
आवर्तदन्तसंयुक्तचक्राणि विधिवत् क्रमात्।।
अनुलोमविलोमैश्च कुर्यात् तेनैव लोहतः।
आवर्तकीलसंयुक्तान् चक्रदण्डान् यथाविधि।।
त्रिवृत्करणतः लोहरज्जून् छिद्रानुसारतः।
कुर्यात् तेनैव लोहेन शङ्कुकीलादयः क्रमात्।।
अन्तः चक्रयुतान्नालस्थम्भान् तन्त्रीसमाकुलान्।
ईशान्यादि क्रमात् केन्द्रस्थानेषु स्थापयेत्क्रमात्।।

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STAMBHANAYANTRA

Whenever an aircraft is frisked or carried away by strong air currents "STAMBHANA YANTRA" or stabilizer is used. This is being described here. A base be prepared about 70cm, thick from a metal known as 'vakra-thunda'. The diameter may be taken as one fourth of the radius of gyrations of the aircraft about a vertical axis passing through the kinetic centre. This base, may be anchored to the main frame of the air-craft in eight places or as may be required, through right-hand and left hand strong screws which can be operated through toothed gearing and wire ropes or a winch crab. So that this base is secured very firmly to the main body and can be raised or lowered through the mechanical apparatus consisting of screws, gears, columns and wire ropes.........e.t.c.

YANTRASARVASWA (91-97)

APASMARANADHOOMA PRASARANAYANTRAM

This is an offensive weapon for protection against the interceptors in case of conflict to make interceptor sick.

स्वकीय व्योमयानस्य विनाशार्थं यदाक्रमान्।।
परेषां व्योमयानावरणं च प्रभवेद्यदि।
तन्निवारयितुं वेगात् सन्धिनालमुखोत्तरे।।
यानस्य स्थापयेद्धीमान् यानतत्त्वविदां वरः।
अपस्मारधूमप्रसारणयन्त्रं दृढं यथा।।

If enemy aircraft encircle our aircraft in a hostile act, to overcome such a situation a toxic smoke tube may be deployed as suggested by the aviation combat experts .

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SABDAKENDRAMUKHA YANTRA

शब्दोत्पत्तिस्थानभेदाः श[illegible]न्द्रा इतीरिताः।
तेभ्यः प्रसारणं यत्स्यात् [illegible]प्रभेदतः।।
तदेव शब्दकेन्द्रमुख[illegible]
तत्रत्य शब्दोपसंहारार्थं तस्मिन् प्रतिष्ठितम्।।
तस्य श्रवणमात्रेण बाधिर्यं यन्तॄणां भवेत्।
अतः तत्परिहाराय शब्दकेन्द्रमुखाभिधम्।
यन्त्रं संस्थापयेत् यानवामभागे यथाविधि।।

VIMANASASTRAM विमानशास्त्रत्रम्

Loud noises are produced at many points. These are referred as noise centers .Each noise centre has to have a noise 'silencers'. It differs depending upon the levels of noise , which may be differed up to three hundred and four levels. This noise can cause permanent damage to ears . Silencers are used to dampen such high noises are called Sabdakendra mukhayantra.

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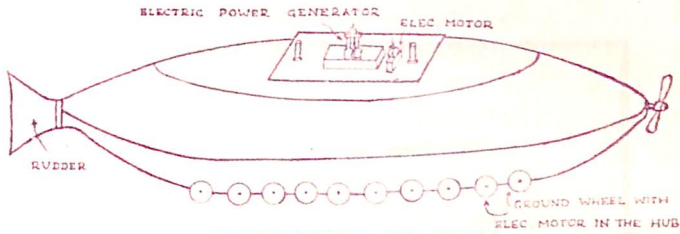
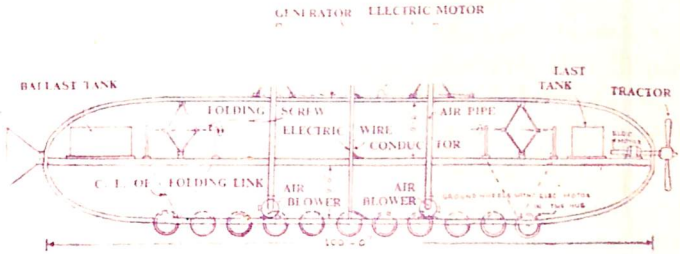
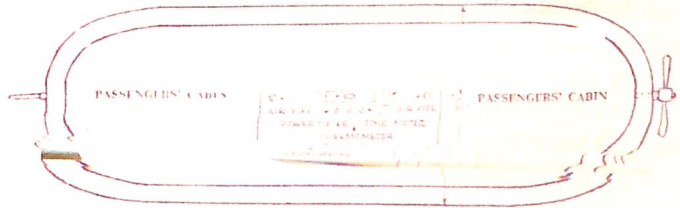
TRIPURA VIMANA

PERSPECIVE VIEW

VERTICAL SECTION

GENERATOR ELECTRIC MOTOR

PLAN

PASSENGERS' CABIN

VAIMANIKA SHASTRAM
MAHARSHI BHARADWAJA

वैमानिकशास्त्रम्
महर्षिः भरद्वाजः

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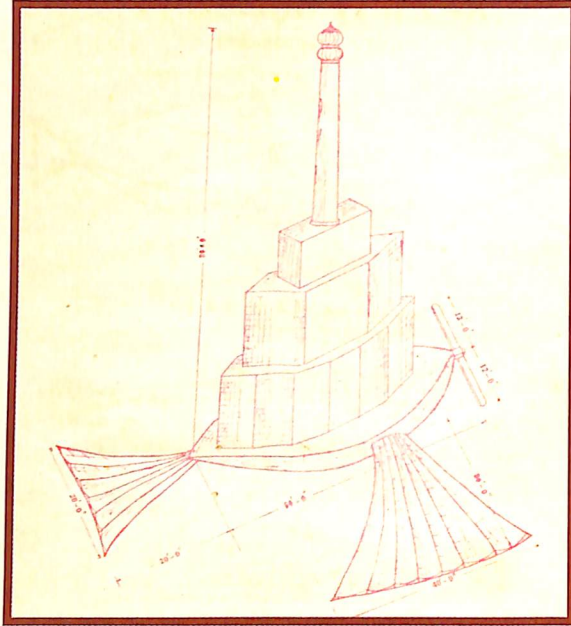
SHAKUNA VIMANA

PERSPECTIVE VIEW

VAIMANIKA SHASTRAM
MAHARSHI BHARADWAJA

वैमानिकशास्त्रम्
महर्षिः भरद्वाजः

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Chemical Laboratory

रसशालां प्रकुर्वीत सर्वबाधाविवर्जिते।
सर्वौषधिमये देशे रम्ये कूपसमन्विते।।
यक्षत्र्यक्षसहस्त्राक्षदिग्विभागसुशोभने।
नानोपकरणोपेतां प्रकारेण सुशोभिताम्।।
शालायाः पूर्वदिग्भागे स्थापयेद्रसभैरवम्।
वह्निकर्माणि चाग्नेये याम्ये पाषाणकर्म च।।
नैर्ऋत्ये शस्त्रकर्माणि वारुणे क्षालनादिकम्।
शोषणं वायुकोणे च वेधकर्मोत्तरे तथा।।
स्थापनं सिद्धवस्तूनां प्रकुर्यादीशकोणके।
पदार्थसङ्ग्रहः कार्यो रससाधनहेतुकः।।

RASARATNASAMUCCHAYA 7 (1-5)

The experiments of ancient Indian Alchemy were conducted in chemical laboratory RASASHALA . A full description of such a laboratory is described in Rasaratnasamucchaya(a Samskrit treatise on chemistry) which is given below.

A laboratory is to be established in a region where abounds in medicinal plants, water and free from all interferences. The building should be well protected with high boundary walls. The laboratory is to be furnished with a variety of equipments.The presiding deity, Rasabhairava made of mercury is to be installed in the east. The furnace should be arranged in the southeast. Stone implements should be kept in the south. In the southwest, apparatus for cutting, slicing etc., should be housed. In the west, washing and cleaning should be arranged. The northwest is reserved for drying operations. Metallic investigations may be carried out in the north. The northeast is reserved for preserving and storing the preparations made in the laboratory.

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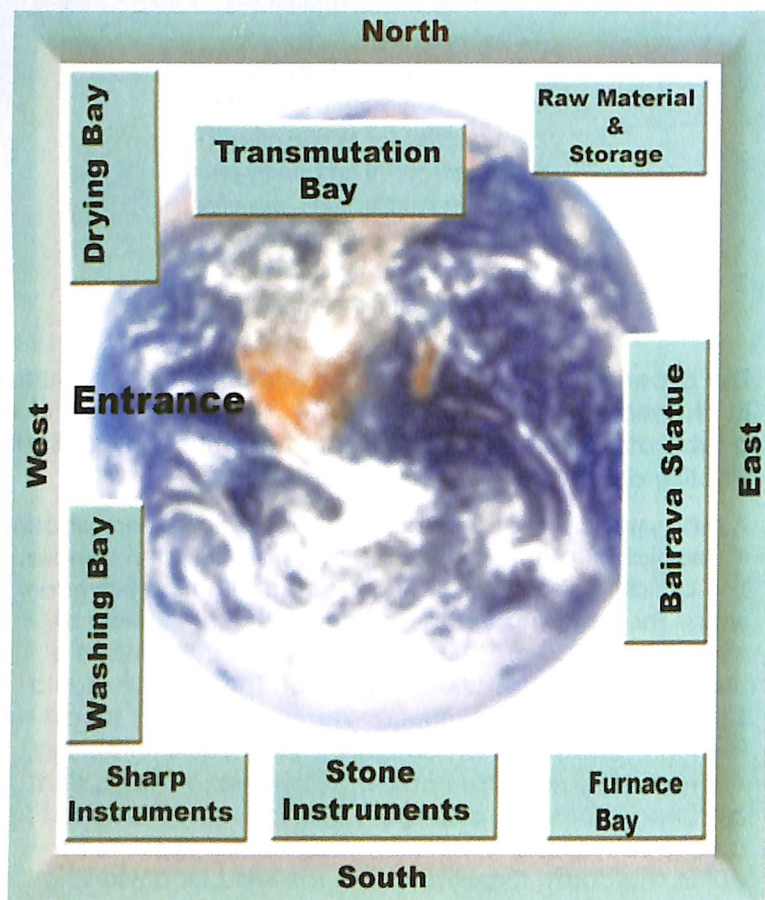
CHEMISTRY

रसशाला

LAY OUT OF THE LABORATORY

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Tiryakpatana yantra

क्षिपेद्रसं घटे दीर्घे नताधोनालसंयुते।
तन्नालं निक्षिपेदन्यघटकुक्ष्यन्तरे खलु।।
तत्र रुद्ध्वा मृदा सम्यग्वदने घटयेरधः।
अधस्ताद्रसकुम्बस्य ज्वालयेत्तीव्रपावकम्।।
इतरस्मिन्घटे तोयं प्रक्षिपेत्स्वादु शीतलम्।
तिर्यक्पातनमेतद्धि वार्तिकैरभिधीयते।।

रसरत्नसमुच्चयम् अध्यायः 9
RASARATNASAMUCHAYA 9.47-49

Place the chemical in a vessel provided with a long tube immersed in an inclined position which enters into another vessel arranged as a reciever.
The mouth of the vessel and the joints should be sealed with clay and cloth.Now put a strong fire at the bottom of the vessel containing the chemicals, while,the other vessel is in cold water. This apparatus (used for distillation) is called Tiryakpatanam.

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Flame Test

आवर्तमाने कनके पीता तारे सिता प्रभा ।
शुल्बे नीलनिभा तीक्ष्णे कृष्णवर्णा सुरेश्वरी ।।
वङ्गे ज्वाला कपोताभा नागे मलिनधूमका ।
शैले तु धूसरा देवि आयसे कपिलप्रभा ।।
अयस्कान्ते धूम्रवर्णा सस्यके लोहिता भवेत् ।
वज्रे नानाविधा ज्वाला खसत्वे पाण्डुरप्रभा ।।

(Rasarnavam 4.49-51)
(900 AD)

The colour of the flame for metals are--

Gold- yellow
Silver - white
Copper - blue
Wrought iron - black
Tin - ash colour
Lead - dirty fire colour
Pure iron - ash
Mica - brown
Diamond - many colours
Khasattva - pale white.

CHEMISTRY

Corrosion & Loss on Heating

Gold & Silver

सुवर्णं रजतं ताम्रं
तीक्ष्णं वङ्गं भुजङ्गमम् ।
लोहन्तु षड्विधं तच्च
यथापूर्वं तदक्षयम् ।।

रसार्णवम - ७/९६
RASARNAVAM 7.96

Gold, Silver, Copper, Iron, Lead, Zinc are the 6 types of metals, their stability (resistance towards corossion / reactivity) is in the reverse order of the above.

copper

iron

lead

Extraction of Mercury

उक्तौषधैर्मर्दितस्य यन्त्रस्थितस्योर्ध्वमधश्च तिर्यक्।
निर्यातनं पातनसंज्ञमुक्तं वङ्गाहिसम्पर्कजकञ्चुकघ्नम् ।।

RASARATNASAMUCHAYA7.67
रसरत्नसमुच्चयः -८.६७

Sublimation is the process to remove the Naaga and Vanga-Doshas from paarada (Mercury). The paarada is ground with the specific drugs and subjected to paatana (sublimation) upwards, downwards (adhahpaatana) and oblique (Tiryakpaatana).

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Salts

लवणानि षडुच्यन्ते सामुद्रं सैन्धवं बिडम्।
सौवर्चलं रोमकञ्च चूल्लिकालवणं तथा।।

RASARATNASAMUCHAYAM 10.11 रसरत्नसमुच्चयः १०-११

There are six types of Salts---

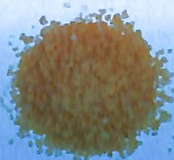
Nacl

- Samudram-Sea salt ($NaCl+MgCl$)

Sea salt

- Saindhavam-Rock salt ($NaCl$ +traces of Na_2S)
- Bida - the salt mixture which produces aqua-regia on heating.
- Sauvarca - KNO_3 (Potassium Nitrate).

Rock Salt

- Romaka - $NaCl$ 75% + Na_2So_4 18% traces of $Na_2Co_3$5%.
- Cullika lavana - salt formed in the hearth by burning wood (NH_4Cl)

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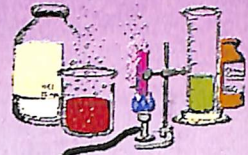
CHEMISTRY

Preparation of Caustic alkali

तं चिकीर्षुः शरदि गिरिसानुजं शुचिरुपोष्य प्रशास्तेऽह्नि प्रशस्तदेशजातम् अनुपहतं मध्यमवयसं महान्तम् असितमुष्तकमधिवास्य अपरेद्युः पाटयित्वा खण्डशः प्रकल्प्य अवपाट्य निर्वाते देशे निचितिं कृत्वा सुधाशकराश्च प्रक्षिप्य तिलनालैः आदीपयेत्। अथ उपशान्ते अग्नौ तद्भस्म पृथग्गृह्णीयात् भस्मशर्कराश्च। ततः क्षारद्रोणम् उदकद्रोणैः परिस्राव्य, महति कटाहे शनैः दर्व्या अवगह्यन् विपचेत्। तमादाय महति वस्त्रे परिस्राव्य इतरं विभज्य पुनः अग्नौ अदिश्रयेत्। स यथा नातिसान्द्रो नातिद्रवश्च भवति मध्यमः, एष एव अप्रतीवापः पक्वः मृदुः, स एव सुप्रतीवापः पक्वः पाक्यः तीक्ष्णः।।

SUSRUTASAMHITA SUTRASTANAM 11-12

Some well grown trees in the forest are cut into logs and piled in a place free from strong wind. Lime stone/scashell should be placed on the piles and then set on fire by stalks of dry plants. When all the wood is burnt out, the fire extinguished, the ashes of the logs and the burnt lime are collected and kept separate and dissolved in water. The extract of the ashes is then mixed with lime water to get the lye which is seperated from the precipitate by filtration. The solution is concentrated to different extent by boiling and it is possible to get dilute, mild and caustic alkali.

Reference : Susruta Samhita, Adhyaya 11 sloka 11 (1000 C.E.)

alkali

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EXPLOSIVES

अङ्गारस्यैव गन्धस्य सुवर्चिलवणस्य च।
शिलाया हरितालस्य तथा सीसमलस्य च।।
हिङ्गुलस्य तथा कान्तरजसः कर्पूरस्य च।
जतोर्निल्याश्च सरलनिर्यासस्य तथैव च।।
समन्यूनाधिकैरंशैरग्निचूर्णान्यनेकशः।
कल्पयन्ति च तद्विद्याश्चन्द्रिकाभातिमन्ति च।।

Sukraniti-senanirupanaprakaranam-206.208

Explosives can be manufactured by mixing following materials in varying amounts: Angara, Suvarchilavana, Sila, Haritala, Seesamala, Hingula, Kantaraja and Camphor.

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Crucible

मुष्णाति दोषान् मूषा या सा
मूषेति निगद्यते।

(Rasaratna-samucchaya 10.2)
(12th century AD)

Musha (crucible) is an instrument used for purifying metals.

उपादानं भवेत्तस्याः मृत्तिका
लोहमेव च।।

(Rasaratna-samucchaya 10.3)

The materials used to make the crucible are clay and iron.

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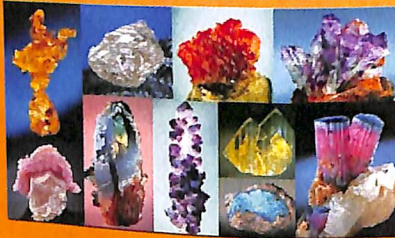
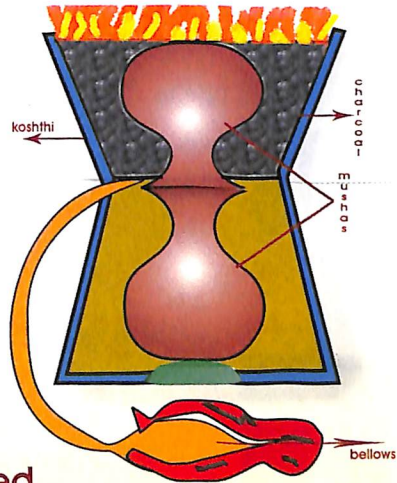

Kosthi yantra

षोडशाङ्गुलविस्तीर्णो हस्तमात्रायतं समं
धातुसत्वनिपातार्थे कोष्ठीयन्त्रमिति स्मृतम्।।
परिपूर्णदृढाङ्गारैरधोवातेन कोष्ठके
मात्रया ज्वालमार्गेण ज्वालयेच्च हिताशनम्।।

रससमुच्चयः अध्यायः 9 RASASAMUCHAYA 9-43 -12th Century

The furnace having the width of 16 cubits and length & height of 18 inches and uniform on all sides is called Koshthi yantram.

This apparatus is used for extracting pure metal content from the ores and minerals.

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METALS AND ALLOYS

सुवर्णं रजतं ताम्रं त्रपु सीसकमायसम्।
षडेतानि च लोहानि
कृत्रिमौ कांस्यपित्तलौ।।

Brass

Silver

Pure metals (lohas)

Suvarna *(gold)*
Rajata *(silver)*
Tamra *(copper)*
Trapu *(tin)*
Sisa or naga *(lead)*
Ayas *(iron)*

Iron

Copper

Alloys (kritimalohas or misradhatavah)

Kamsya *(bronze)*
Pittala *(brass)*

Tin

Bronze

Gold

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EXTRACTING PURE METAL

न विस्फुलिंगो न च बुद्बुदाश्च
यथा न रेखापटलं न शब्दः।
मूषागतं रत्नसमं स्थिरश्च
तथा विशुद्धं प्रभवेच्च लोहम्।।

रसार्णवम् 4 .52 AD 900
RASARNAVAM

WHEN HEATED IN THE FURNACE WITHOUT SPARKS OF FIRE, BUBBLES, CRYSTALLIZATION AND CRACKLING SOUND, (ONE) GETS STRONG, PURE METAL WITH THE GLOW OF A JEWEL.

A STEELY WILL IS NEEDED TO SPREAD THIS SPARLING GLORY!

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LOSS DURING HEATING

अग्नौ सुवर्णमक्षीणं
रजते द्विफलं शते।
अष्टौ त्रपुणि सीसे च
ताम्रे पञ्चदशायसि।।

(Yajnyavalkya Smriti, Vyavaharadhyaya 2.178)

When strongly heated in fire the loss of weight for GOLD is nil, for

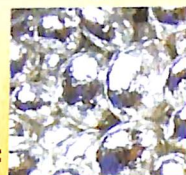
Silver 2%

Tin 8%

Lead 5%

Copper 5%

Iron 10%

GOLD

SILVER

TIN

IRON

COPPER

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SOURCES OF GOLD

रसजं क्षेत्रजं चैव
लोहसङ्करजं तथा ।
त्रिविधं जायते हेम
चतुर्थं नोपलभ्यते ।।

RASARNAVAM - 7.99

Gold is obtained from chemicals, mines and mixture of metals.

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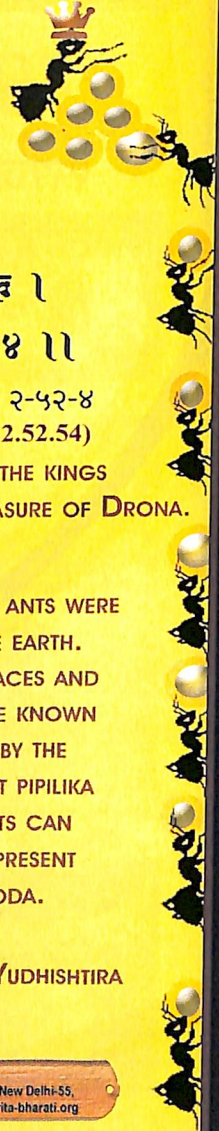
GOLD MINING BY ANTS

तद्वै पिपीलिका नाम उद्धृतं यत्पिपीलिकैः ।
तद्रूपं द्रोणमेयमहार्षुः पुञ्जाशो नृपाः ।। ४ ।।

महाभारतम्, २-५२-४
(MAHABHARATAM 2.52.54)

THAT (GOLD) BY NAME PIPILIKA, TAKEN OUT BY ANTS, THE KINGS AND THE REPRESENTATIVES OF THE SUBJECTS GAVE TO THE MEASURE OF DRONA.

ACCORDING TO THE ABOVE REFERENCE, IT SEEMS THAT ANTS WERE DIGGING OUT AURIFEROUS SAND FROM BENEATH THE EARTH. SUCH SAND MUST HAVE ACCUMULATED AT VARIOUS PLACES AND WAS SELECTED BY PEOPLE. SUBSEQUENTLY, GOLD TO BE KNOWN AS PIPILIKA GOLD WAS SEPARATED FROM THE SAND BY THE PANNING PROCESS. IT IS REASONABLE TO BELIEVE THAT PIPILIKA GOLD MUST HAVE BEEN POWDERY AND FINE, AS ANTS CAN CARRY ONLY VERY SMALL PARTICLES, AND THAT WAS PRESENT IN THE SANDS OR NEARBY AREA OF THE RIVER SAILODA.

VARIOUS KINGS PRESENTED THIS PIPLIKA GOLD TO KING YUDHISHTIRA DURING RAJASUYAYAJNA

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BRONZE

अष्टभागेन ताम्रेण द्विभागकुटिलेन च।
विद्रुतेन भवेत् कांस्यं तत् सौराष्ट्रभवं शुभम्।।

RASARATNASAMUCCHAYA-5.204 (900AD)

Bronze is obtained by melting 8 parts of copper and 2 parts of tin together. This was practised more in Sourashtra.

Bharat Takes the Gold medal for Bronze invention!!

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QUALITY OF BRASS

गुर्वी मृद्वी च पीताभा सारङ्गी ताडनक्षमा।
सुस्निग्धा मसृणाङ्गी च रीतिरेतादृशी शुभा।
पाण्डुपीता खरा रूक्षा बर्बरा ताडनाक्षमा।
पूतिगन्धा तथा लघ्वी रीतिर्नैष्टा रसादिषु।।

RASARATNASAMUCCHAYA- 5.195,196

FEATURES OF SUPERIOR QUALITY BRASS-

* HEAVY
* SOFT
* WITH BEAUTIFUL YELLOW COLOUR
* UNBREAKABLE ON HAMMERING &
* SLIM.

FEATURES OF INFERIOR QUALITY BRASS-

* WHITISH YELLOW
* ROUGH TO TOUCH
* DIRTY
* BREAKABLE ON HAMMERING
* HAS FOUL SMELL
* LIGHT IN WEIGHT &
* SHOULD NOT BE USED IN CHEMICAL PROCESS.

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Bell Metal

स्वल्पतालयुतं कांस्यं
वङ्कनालेन ताडितम्।
मुक्तरङ्गं हि तत् ताम्रं
घोषाकृष्टमुदाहृतम्।।

रसरत्नसमुच्चयः ८.३७ (AD 900)

(RASARATNASAMUCHCHAYA 8.37) - (A.D.900)

*In a ringing tone we proclaim,
Bharat's mettle was supreme!!*

If bronze and a little Arsenic sulphide are mixed and heated in Vankanala (an apparatus), a part of Arsenic sulphide is lost and it forms a metal called Ghoshakrishta (bell metal).

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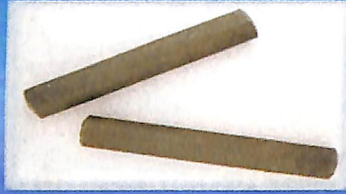
LEAD

द्रुतद्रावं महाभारं छेदे कृष्णसमुज्ज्वलम् ।
पूतिगन्धं बहिः कृष्णं शुद्धं
सीसमतोऽन्यथा ॥

रसरत्नसमुच्चयः ५-७७ (900 AD)
(Rasaratnasamuchchaya 5.77) -(A.D.900)

Pure lead is easy to melt, dense, ductile, has foul smell and black outer covering.

Lead without these properties is impure.

With Bharat in the lead, the world is sure to tread!

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CLASSIFICATION OF IRON

Carbon steel

मुण्डं तीक्ष्णं च कान्तं च त्रिप्रकारमयः स्मृतम्।
मृदु कुण्डं कडारञ्च त्रिविधं मुण्डमुच्यते।।
खरं सारञ्च हृन्नालं तारावट्टञ्चवाजिरम्।
काललोहाभिधानञ्च षड्विधं तीक्ष्णमुच्यते।।
भ्रामकं चुम्बकञ्चैव कर्षकं द्रावकं तथा।
एवञ्चतुर्विधं कान्तं रोमकान्तञ्च पञ्चमम्।।

रसरत्नसमुच्चयः - ५/६७,७४,८३
RASARATNA SAMUCCHAYA-5.67,74,83

Cast Iron

There are 3 types of iron known as *Munda loha* (cast iron) *Tikshna loha* (wrought iron) and *Kanta loha* (carbon steel).
They are further classified:

1. *Munda loha*
   1. Mrudu 2. Kunta 3. Kadara.
2. *Tikshna loha*
   1. Khara 2. Saara 3. Hrunnala 4. Taravatta 5. Vajira 6. Kalaloha.
3. *Kanta loha*
   1. Bhramaka 2. Chumbaka 3. Karshaka 4. Dravaka 5. Romakanta

Wrought iron

When we know what we knew, what results is unalloyed happiness!

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IRON AND STEEL

Iron Pillar at Delhi probable date,400 A.D

Mechanical data

Height 7.39mts(24’3”)

Diameter At the top 30.60cms(12.05’)

At the bottom 41.65 cms(16.4”)

Weight 6 tons

Chemical composition

Fe - 99.72%

C - 0.08%

Si - 0.,046%

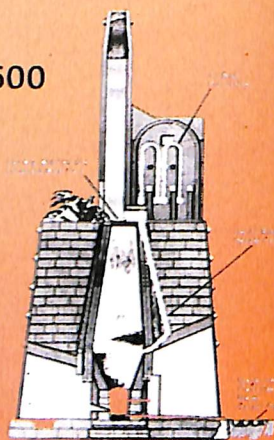
S - 0.006%

P - 0.114%

Mn - Nil

The pillar is existing for the last 1600 years without rust or decay

IRON FURNACE USED BY INDIANS

The British in 18th century A.D. preferred Indian iron for manufacturing steel of good quality.

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METALS

MODERN OBJECT GOLD JEWELLERY

Modern golden ornaments were used in Mohenjo daro 3000 B.C

BRASS AND BRONZE

Bronze Elephant, Calcolithic Period, 1300 B.C.
Brass - Alloy of Copper + Zinc
Bronze - Alloy of Copper + Tin

The Chinese Pilgrim Hiuen Tsang has given a description of a brass temple (Height - 30.48 meters (100') being built by King Harsh, near Nalanda.

ZINC

Indians knew the extraction of Zinc from ore by distillation as early as 400 B.C. The Europeans came to know the Zinc distillation process only in 1748 A.D. when William, Campion patented it.

COPPER

Copper was chiefly mined in Rajasthan, Bihar and Andhra Pradesh. The huge statue of Lord Buddha (Birmingham Museum, U.K.) is example of spectacular achievements of excellence in Copper Metallurgy.
Lord Buddha Statue
Height 2.29 Mts (7'6")
Weight 1 Ton
Period 500 A.D

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59
MATHEMATICS
ZERO
0
SUNYA
Sanskrit
SI-FIR
Arabic
ZIFFIRE
Latin
0 SUNYA
ZERO
English
"We owe a lot to Indians,who taught us how to count, without which no worth-while scientific discovery could have been made"
-Albert Einstien
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MATHEMATICS

Numbers

Ingenious Hindu Invention

Early Hindu Numerals

Brahmi Inscription (300 B.C.)

Devanagari Inscription (1100 A.D)

१ २ ३ ४ ५ ६ ७ ८ ९ ०

Modern

1 2 3 4 5 6 7 8 9 0

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ARITHMETIC

LARGE AND SMALL NUMBERS

How Big	*How small*
Koti-10^{7}	Pada-1/4
Titilamba-10^{27}	Sapha-1/8
Sarvabala-10^{45}	Kustha-1/12
Tallaksana-10^{53}	Kala-1/16

The largest number known to ancient Greeks was Myriad = 10^{3} and to the Romans Mille = 10^{4}. In India, from the time of Vedas, very large and small numbers were computed.

The world counts on Vedic wisdom!

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MATHEMATICS

Square and cube roots

भागं हरेदवर्गान्नित्यं द्विगुणेन वर्गमुलेन।
वर्गाद्वर्गे शुद्धे लब्धं स्थानान्तरे मुलम्।।

(Aryabhatiyam)
(476 AD)

One should divide the non-square place by twice the square root of the square place, then subtract the square from the next square place.

THE PRESENT METHOD OF EXTRACTING THE SQUARE AND CUBE ROOT BY DIVISION WAS INVENTED BY ARYABHATA IN AD 476

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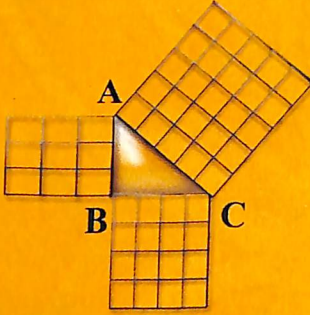
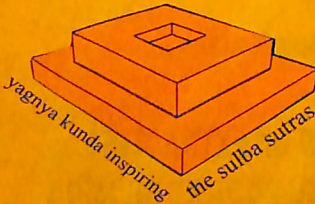
BAUDHAYANA SUTRA (THEOREM)

बौधायनसूत्रम्

$$AC^2 = AB^2 + BC^2$$

This theorem now known as **Pythagoras theorem** was known to Indians - 1000 years before Pythagoras.

"The Pythagoras theorem had its origin in the **Sulba Sutras of Baudhayana and Apastamba**" - Leopold Van Schroeder, Indologist.

दीर्घचतुरसस्याक्ष्णया रज्जुः
पार्श्वमानी तिर्यक्मानी च
यत्पृथग्भूते कुरुतस्तदुभयं करोति।।

The areas (of the squares) produced separately by the length and breadth of a rectangle together equal the area (of the square) produced by the diagonal.

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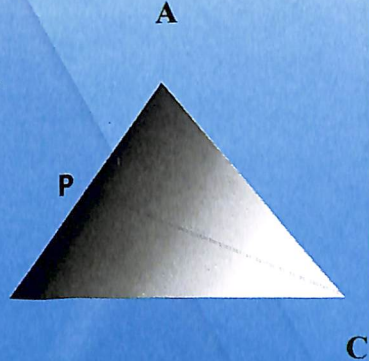
AREA OF TRIANGLE

Aryabhata (476 A.D.)

Modern method

Area ABC=(1/2 Base) X (Altitude)

त्रिभुजस्य फलशरीरं
समदलकोटी
भुजार्धसंवर्गः

The area of a triangle is the product of 1 / 2 of one side and the Perpendicular (from opposite vertex) to it. (1/2 AB) X CP.

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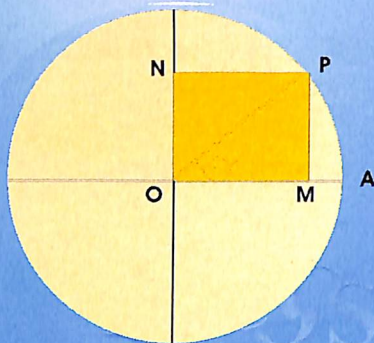
TRIGONOMETRY

The invention of Trigonometry is an important gift of Bharat to the world of Mathematics.
Half chord PM = Ardha Jya
Half chord PN = OM = Koti Jya

Modern definition

Modern Definition: Jya AP = PM = R sinQ
Koti Jya AP = OM = R cosQ
The Indian Jya & Koti Jya became the sine and cosine in European languages!!

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Units of Angle measurement

विकलानां कलाषष्ट्याः तत् षष्ट्या भाग उच्यते।
तत्त्रिंशतां भवेद्राशिः भगणो द्वादशैव ते ।।

सूर्यसिद्धान्तः –१२८

60 Vikala = 1 Kala
60 Kala = 1 Bhaga
30 Bhaga = 1 Rasi
12 Rasi = 1 Bhagana (celestial sphere)

In the modern notation Vikala is a second, Kala is a minute, and Bhaga is a degree. It is indeed remarkable that ancient system of measurement of angles is identical to the present system.

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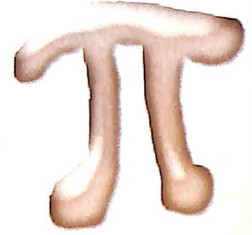
VALUE OF PI

चतुरधिकं शतमष्टगुणं
द्विषष्ट्यटिस्तथा सहस्राणाम्।
अयुतद्वयविष्कम्भस्य आसन्नो
वृत्तपरिणाहः। आर्यभटीयम्

ADD FOUR TO ONE HUNDRED MULTIPLY BY EIGHT THEN ADD SIXTY TWO THOUSAND THEN DIVIDE BY TWENTY THOUSAND RESULT IS APPROXIMATELY CIRCUMFERENCE OF A CIRCLE OF DIAMETER OF TWENTY THOUSAND .

Aryabhata called it an approximate (asanna) value

VALUE OF

$$\text{Pi} = \frac{\text{circumference}}{\text{DIAMETER}} = \frac{62832}{20000} = 3.1416$$

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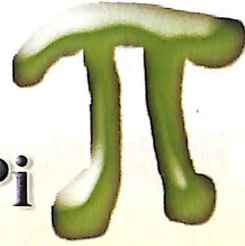
MATHEMATICS

The value of Pi π

गोपी भाग्य मधुव्रात श्रृङ्गीशो दधिसन्धिग।
खलजीवति खाताव गलहालारसन्धर।।

-भारतीतीर्थः

This sloka,a hymn to lord krishna or shiva gives the value of pi to 31 decimels.
Pi=3.1415926535897932384626433832792

There is an arrangement called *KATAPAYADI SAMKHYA* unique to *Samskrit* where the consonants are given numbers as follows:

क 1 ख 2 ग 3 घ 4 ङ 5

च 6 छ 7 ज 8 झ 9 ञ 0

ट 1 ठ 2 ड 3 ढ 4 ण 5

त 6 थ 7 द 8 ध 9 न 0

प 1 फ 2 ब 3 भ 4 म 5

य 1 र 2 ल 3 व 4

श 5 ष 6 स 7 ह 8

Thus the above *sloka* gives the value of pi to 31 decimals.

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MEDICINE

Eight Specialties of Ayurveda

तस्यायुर्वेदस्याङ्गान्यष्टौ तद्यथा कायचिकित्सा
शालाक्यं शल्यापहर्तृकं विषगरवैरोधिकप्रशमनं भूतविद्या
कौमारभृत्यकं रसायनं वाजीकरणमिति।।

Charakasmhita-sutrastanam-30.28

There are 8 branches of Ayurveda

Kayachikitsa (Body treatment)
Shaalaakyam (E N T)
Shalyachikitsa (Surgery)
Vishagara-vairodhika-prashamanam (Toxicology)
Bhutavidya (Psychiatry)
Kaumaara-bhrutyakam (Paediatrics)
Rasaayanam (Treatment with chemicals)
Vaajikaranam (Aphrodiasiacs)

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PATHOLOGY

IN ANCIENT INDIA

ते (व्याधयः) चतुर्विधाः - आगन्तवः शारीराः मानसाः स्वाभाविकाश्चेति। ते पुनः सप्तविधाः । तद्यथा आदिबलप्रवृत्ताः जन्मबलप्रवृत्ताः दोषबलप्रवृत्ताः सङ्घातबलप्रवृत्ताः कालबलप्रवृत्ताः दैवबलप्रवृत्ताः स्वभावबलप्रवृत्ताः इति।।

- (सुश्रुतसंहिता-सूत्रस्थानम् अ-1, खण्डिका 24; अ-24 खण्डिका4)

SUSRUTA SAMHITA - SUTRA STANAM 1.24 - (BC 400)

THEY (DISEASES) ARE OF FOUR TYPES - EXOGENOUS, ENDOGENOUS, PSYCHIC AND NATURAL.

THEY AGAIN ARE OF SEVEN CATEGORIES, CAUSED BY

* PRE-CONCEPTIONAL AND HEREDITARY FACTORS.
* POST-CONCEPTIONAL FACTORS.
* VITIATION OF HUMOURS
* CONTAGIOUS
* CAUSED BY SEASON.
* CAUSED NATURAL FORCES
* CAUSED BY NATURE OF THE BODY

DOCTORS IN ANCIENT INDIA ADOPTED SUCH DETAILED CLASSIFICATION OF DISEASES

Humours of the body and Mind

त्रयः शरीरदोषाः वातपित्तश्लेष्मणः, ते शरीरं दूषयन्ति, द्वौ पुनः सत्त्वदोषौ रजस्तमश्च तौ सत्त्वं दूषयतः । ताभ्याञ्च सत्त्वशरीराभ्यां दुष्टाभ्यां विकृतिरुपजायते, नोपजायते चाप्रदुष्टाभ्याम् ।।

चरकसंहिता-शारीरस्थानम्-४.३४
(Charaka Samhita - Sharirasthanam 4. 34)

There are three body-humours - Vata, Kapha and Pitta. They vitiate the body. Again (there are) two mental humours active and inert. They vitiate the mind. By the vitiations of those two - body and mind, disease manifests, and by their non-vitiation, (the diseases) do not occur.

Modern science is yet to understand the Vata, Kapha, and Pitta constituents of Ayurveda?? !

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Embryology

गर्भस्य चत्वारि चतुर्विधानि
भूतानि मातापितृसम्भवानि।
आहारजन्यात्मकृतानि चैव
सर्वस्य सर्वाणि भवन्ति देहे॥

चरकसंहिता शरीरस्थानम् २.२६
(Charaka Samhita - Sharirasthanam 2.26)

An embryo has four components, derived from--

- **Mother**
- **Father**
- **Food &**
- **Developed by itself.**

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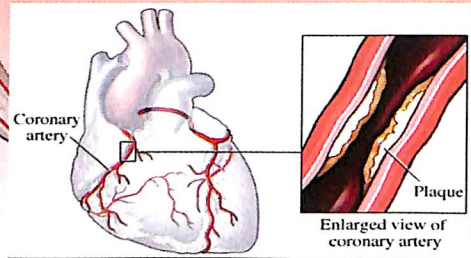
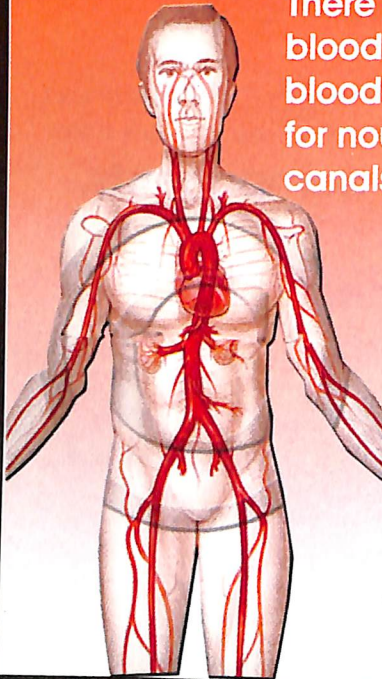
Arteries

धमन्यो रक्तवाहिन्यश्चतुर्विंशतिरीरिताः ।
कुल्याभिरिव केदारास्ताभिर्देहोऽभिवर्धते ।।

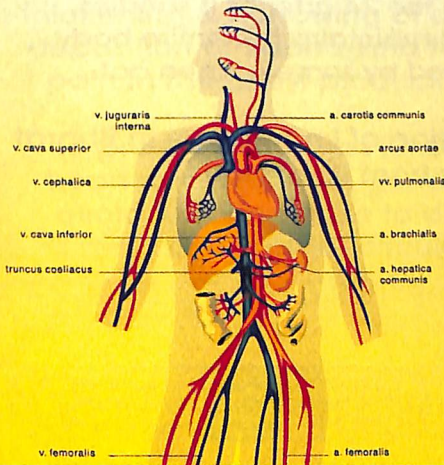
सङ्गीतरत्नाकरः -२.१०५-१०६
(Sangita-ratnakara 2.105)

There are 24 arteries that carry blood. These arteries take nutrient blood to different parts of the body for nourishing the body just as canals take water to farms.

Enlarged view of coronary artery

Blood Flow

हृदो रसो निस्सरति तस्मादेति च सर्वशः ।
सिराभिर्हृदयं वैति तस्मात्तत्प्रभवाः
सिराः ।।

- भेलसंहिता -२०.३
(Bhela-samhita 20.3)

Rasa (blood) flows from the heart and then to all places.Through the veins it again reaches the heart.

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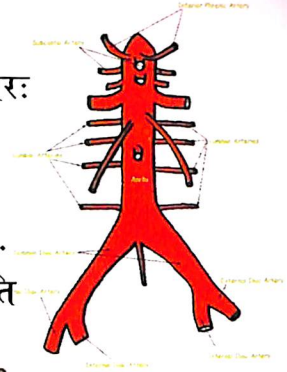
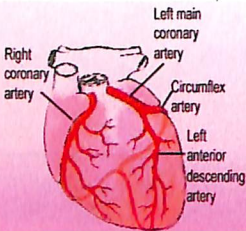
Blood Circulation

आहारस्य सम्यक् परिणतस्य यस्तेजो भूतसारः
परमसूक्ष्मः स रस इत्युच्यते
तस्य हृदयं स्थानम् ।
स हृदयात् चतुर्विंशतिधमनीरनुप्रविश्य.....
कृत्स्नं शरीरमहरहः तर्पयति वर्धयति धारयति
यापयति च अदृष्टहेतुकेन कर्मणा ।।

Susrutasamhita - sutrastanam 14.3

The very subtle energy from the well-digested food is called rasa (the nourisher liquid). Its place is the heart. From the heart through the 24 arteries,it satisfies, nourishes, supports and maintains the entire body day after day, propelled by some unseen act.

Failing to see the circulation of knowledge in Bharat is to go away from its heart!!

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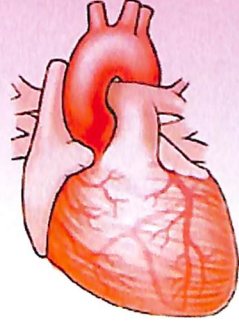
Isocheim Heart Disease

कफपित्तावरुद्धस्तु मारुतो रसमूर्छितः ।
हृदिस्थः कुरुते शूलमुछ्वासारोधकं परम् ।।

सुश्रुतसंहिता, उत्तरतन्त्रम् (500BC)

तन्महता महामूलास्तच्चौजः परिरक्षिताः ।
परिहार्या विशेषेण मनसो दुःखहेतवः ।।
हृद्यं यत् स्याद्यदौजस्यं स्त्रोतसां यत् प्रसादनम् ।
तत्तत् सेव्यं प्रयत्नेन प्रशमो ज्ञानमेव च ।।

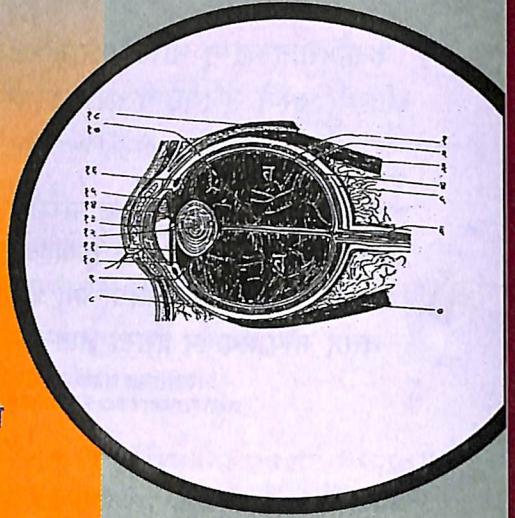
चरकसंहिता सूत्रस्थानम् ३०/१३-१४ (500BC)
susrutasamhita-sutrastanam 30.13-500BC

Pathology of IHD involves a transient spasm or thickening & narrowing of arteries with the physical deposition of Kapha-Pitta factors leading to acute pain in the chest producing breathing difficulty.

To preserve the Ojas (Energy) and maintain the heart and vessels in good condition, one should avoid worrying, take to diet conducive to heart and channels of circulation and maintain mental poise.

MEDICINE

CROSS SECTION OF IRIS

१ स्फाटिककला
२. रधानी
३ उत्तराक्षिगोळीयाजिह्मपेशी
४ जरायुपटलम्
५ शुक्लपटलम्
६ रधालीमध्यधमनी
७ अधराक्षिगोळीयाजिह्मपेशी
८ मण्डलावरप्यास्तोरणिका
९ स्नाय्वन्तरनाळी
१० शैलिकप्ररोहः
११ परितारकम्
१२ काचमण्डलं
१३ कृष्णमण्डलं
१४ पुरस्तनागारः
१५ पश्चिमागारः
१६ कृष्णपटलनाळी
१७ स्फाटिकनाळी
१८ उत्तरवर्त्मोन्नमनी. त.त तर्पकः

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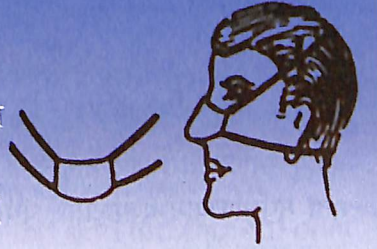
Plastic Surgery of Nose

विश्लेषितायास्त्वथ नासिकाया वक्ष्यामि
सन्धानविधिं यथावत् ।
नासाप्रमाणं पृथिवीरुहाणां पत्रं
गृहीत्वा त्ववलम्बितस्य ।।
तेन प्रमाणेन हि गण्डपार्श्वादुत्कृत्य
बद्ध्नात्वथ नासिकाग्रम् ।
विलिख्य चाशु प्रतिसन्दधीत तत्
साधुबन्धैर्भिषगप्रमत्तः ।।

सुश्रुतसंहिता-सूत्रस्थानम् - १६.२७,२८ 500B.C.E.

(Sushruta-samhita - Sutrasthanam 16.27,28) (500 BC)

I will tell (you) exactly, the method of loaning of disjoint nose. The doctor should;

1. Take nose-sized leaf of a tree supported (on the forehead)
2. Cut the skin from the cheeks to the size of the leaf.
3. Trace on the leaf the profile of the nose and
4. Immediately join that (skin) carefully with appropriate bandage.

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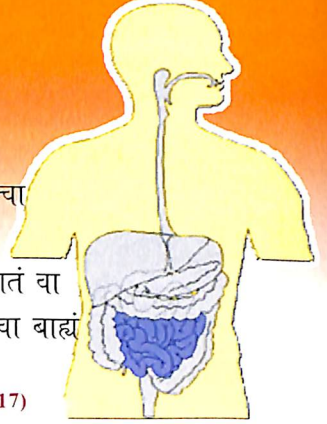
Intestinal Surgery

बद्धगुदे परिस्राविणि च स्निग्धस्विन्नस्याभ्यक्तस्याधो
नाभेर्वामश्चतुरङ्गुलमपहाय रोमराज्या उदरं पाटयित्वा
चतुरङ्गुल-प्रमाणमान्त्राणि निष्कृत्य निरीक्ष्य
बद्धगुदस्यान्त्रप्रतिरोधकरश्मानं वालं वाऽपोह्य मलजातं वा
ततो मधुसर्पिभ्यामभ्यज्यान्त्राणि यथास्थानं स्थापयित्वा बाह्यं
व्रणमुदरस्य सीव्येत् ।

(Sushruta-samhita - Chikitsasthanam 14.17)
(500 BC)

In the blocked large intestine and urinary passage-

1. Put the patient through fermentation, sweating and massaging
2. Make a four-finger-wide incision below the navel four-finger- wide left of hair (that stretches downward from the naval)
3. Extract the intestine and check it
4. Removing stone, hair, or faecal matter blocking the intestine of the patient
5. Smear the intestine with honey and clarified butter
6. Place the intestine in its original position, and
7. Stitch the external wound of the stomach.

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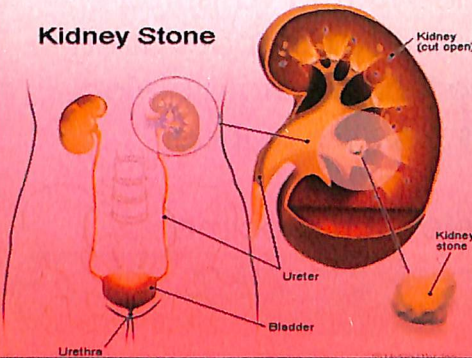
Kidney Stone Removal

ततः सव्ये पार्श्वे सेवनीं यवमात्रेण
मुक्त्वाऽवचारयेच्छस्त्रश्मरीप्रमाणं दक्षिणतो वा
क्रियासौकर्यहेतोरित्येके, यथा सा न भिद्यते चूर्ण्यते वा तथा
प्रयतेत , चूर्णमल्पमप्यवस्थितं हि पुनः परिवृद्धिमेति,
तस्मात् समस्तामग्रवक्त्रेणाददीत ।।

(SUSHRUTA-SAMHITA - CHIKITSASTHANAM 7.33) (500 BC)

सुश्रुतसंहिता-चिकित्सास्थानम् -७.३३

Then employ the needle on the left side leaving out only a grain of space. Some say, for the convenience of operation, employ the knife on the right side leaving out bladder-stone size space. Attempt such that it (the bladder stone) is not broken or powdered. Even if a small quantity of particle remains, it would again grow. Therefore remove entirely with a curved forceps.

sushruthasamhita-chikitsasthanam

MEDICINE

Test Tube Baby

सत्रे ह जादाविषिता नमोभिः कुम्भे रेतः सिषिचतुः समानम् ।
ततो ह मान उदियाय मध्यात् ततो जातमृषिमाहुर्वसिष्ठम् ।।

(Rig Veda 7.33.13)

Consecrated for the sacrifice, propitiated by praises, they (Mitra & Varuna) poured a common effusion into the water jar, from which Mana (Agastya) & Vasishtha were born. Mitra & Varuna, the deities mentioned in the Vedas developed Agastya and Vasishtha in a utensil called vasativara (a compact abode of liquid). Later in the Mahabharata period test-tube babies were developed.

Kripa & Drona were such specimen.

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Medicinal Properties of Gold

आयुर्लक्ष्मीप्रभाधीस्मृतिकरमखिलव्याधिविध्वंसि पुण्यं
भूतावेशप्रशान्तिस्मरभरसुखदं सौख्यपुष्टिप्रकाशि।
गाङ्गेयञ्चाऽथ रुप्यं गदहरमजराकारि मेहापहारि
क्षीणानां पुष्टिकारि स्फुटमतिकरणं वीर्यवृद्धिप्रकारि।।
स्निग्धं मेध्यं विषगदहरं बृंहणं वृष्यमग्र्यं
यक्षोन्मादप्रशमनपरं देहरोगप्रमाथि।
मेधाबुद्धिस्मृतिसुखकरं सर्वदोषामयघ्नं
रुच्यं दीप्तिप्रशमितरुजं स्वादुपाकं सुवर्णम्।।

RASARATNASAMUCHAYA-5.3-5.20

1. Gold enhances the life span
2. It enhances wealth
3. It enhances body complexion
4. It enhances intellect and memory
5. It can eradicate the spell of evil spirit and is a good aphrodisiac
6. It brings about a sense of well being
7. It provides nourishment to the body

8. It is unctuous
9. It is good brain tonic
10. It eradicates poisoning effects
11. It cures Yaksma, Unmada and many other diseases
12. It improves the Dharana Sakti (retention power) and Grahana Sakti (grasping power)
13. It can cure the diseases orginated by all three Doshas
14. It improves the taste as well as digestive powers
15. It is sweet in cooking &
16. It wards off all types of diseases.

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Iron as Medicine

आयुः प्रदाता बलवीर्यकर्ता
रोगापहर्ता मदनस्य धाता ।
अयस्समानं न हि किञ्चिदस्ति
रसायनं श्रेष्ठतमं नराणाम् ।।

रा.ज. नि.१.२

The term Ayas (the Iron) is mentioned in the Rig Veda.

Iron increases strength,Virility and longevity. It cures diseases. There is no equivalent to iron (among the metals), which is so favorable to human species.

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MEDICINE

Medicinal use of air

द्वाविमौ वातौ वात आ सिन्धोरा परावतः।
दक्षं ते अन्य आवातु व्यन्यो वातु यद् रपः।।

अथर्ववेदः -४.१३.२

Atharva veda 4.13.2

The two winds blow from the river as far as the distance; ones blows strength; the other blows away the ailments.

Wind, the healer of wounds has medicinal properties and capable of rejuvenating !

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MEDICINE

Pulse-Test

करस्याङ्गुष्ठमूले या धमनी जीवसाक्षिणी।
तच्चेष्टया सुखं दुःखं ज्ञेयं कायस्य पण्डितैः॥

नाडीदर्पणम्

Experts know the health or disease of the body through testing the life-indicating pulse (Nadi) below the root of the thumb.

YOUR HEALTH - VIRTUALLY IN YOUR HANDS!

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Parts of Medicinal Plants to be used

अतिस्थूलजटायाः स्युस्तासां ग्राह्यास्त्वचो बुधैः।
गृह्णीयात्सूक्ष्ममूलानि सकलान्यपि बुद्धिमान्।।
महन्ति येषां मूलानि काष्ठगर्भाणि सर्वतः।
तेषां तु वल्कलं ग्राह्यं ह्रस्वमूलानि सर्वथा।।

भावप्रकाशः (16th Century)
(Bhavaprakasha)

The method of collecting parts of plants is as follows: In case of plants with thick roots, the root-bark is to be selected and in the case of plants with thin roots, the whole root should be used. In the case of trees with big roots & with much xylem, the bark is preferable, & in the case of plants with slender roots the whole plant should be selected.

Planting a sure way to definite health the Bharatiya way, which is not a myth!!

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Defects of irregular sleep

जृम्भाङ्गमर्दस्तन्द्रा च
शिरोरोगाक्षिगौरवम्।
निद्राविधारणात्तत्र
स्वप्नसंवाहनानि च।।

Due to irregular sleep one gets yawn, body pain, laziness, headache, swelling in the eyes and dreams.

रात्रौ जागरणं रूक्षम् स्निग्धं प्रस्वप्नं दिवा।
अरूक्षमनभिष्यन्दत्वासीनप्रपलायितम्।।

(Charaka-samhita 20) (चरकसंहिता सूत्रस्थानम्- २०)

Waking during night causes stiffness in the body, sleep in the day causes softness in the body. Day- sleeping in sitting posture will not affect one.

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SYMPTOMS OF CURE

कार्यं धातुसाम्यं तस्य लक्षणं विकारोपशमः।
परीक्षात्वस्य रुगुपशमनं स्वर्णवर्णयोगः शरीरोपचयः बलवृद्धिः
अभ्यवहार्याभिलाषः रुचिराहारकाले अभ्यवहृतस्य चाहारस्य काले
सम्यग्जरणं निद्रालाभो यथाकालं वैकरीणां च स्वप्नानामदर्शनं
सुखेन च प्रतिबोधनं वातमूत्रपुरीषरेतसां मुक्तिः
सर्वाकारैर्मनोबुद्धीन्द्रियाणां चाव्यापत्तिरिति।।

चरकसंहिता-विमानस्थानम् -८९

(Charaka-samhita 89)

In Ayurveda The task is to attain the equilibrium
of primary fluids (humours) in the body.
Its characteristic feature is the pacification of aberrations.

The test of the cure is the abating of the disease,
normalcy of voice and colour (of the skin)
, growth of the body, increase in strength, desire for eating,
digestion of the food that is eaten, getting sleep at the
proper time, not having nightmare, waking up happily,
non impairment of the mind, intellect
and sense organs in all aspects.

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BIO - PHYSICAL CLASSIFICATION

जीवाः श्रेष्ठाः ह्यजीवानां ततः प्राणभृतः शुभ।
ततः सचिताः प्रवरास्ततश्चेन्द्रियवृत्तयः।।
तत्रापि स्पर्शवेदिभ्यः प्रवरा रसवेदिनः।
तेभ्यो गन्धविदः श्रेष्टास्ततः शब्दविदो वराः।।
रूपभेदविदस्तत्र ततश्चोभयतोदतः।
तेषां बहुपदाः श्रेष्ठाश्चतुष्पादस्ततो द्विपात्।।

श्रीमद्भागवतम् स्कं-३. अ-२९. २८-३०
(Bhagavatam 3.29.28,29,30)

· THE SENTIENT BEINGS ARE SUPERIOR TO INSENTIENT
· THE INTELLIGENT ARE STILL SUPERIOR
· BEINGS THAT CAN USE THEIR SENSES ARE STILL SUPERIOR
· BEINGS WITH THE SENSE OF TASTE ARE SUPERIOR TO THOSE WITH THE SENSE OF TOUCH
· BEINGS WITH SENSE OF SMELL ARE SUPERIOR TO THEM
· THOSE WITH THE AUDITORY SENSE ARE SUPERIOR TO THEM
· BEINGS WITH SENSE OF SIGHT ARE SUPERIOR TO THE EARLIER ONES
· THOSE WITH TWO ROWS OF TEETH ARE SUPERIOR TO THEM
· THE MULTIPEDS ARE SUPERIOR TO THEM
· QUADRUPEDS ARE SUPERIOR TO THEM
· BIPEDS ARE SUPERIOR TO QUADRUPEDS.

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BOTANY

Classification Of Plants

वनस्पतिद्रुमलता गुल्माः पादपजातयः।
बीजात्काण्डात्तथा कन्दात्तज्जन्म त्रिविधं विदुः।।

ते वनस्पतयः प्रोक्ताः विना पुष्पैः फलन्ति ये।
द्रुमाश्च ते निगदिताः सहपुष्पैः फलन्ति ये।।

प्रसरन्ति प्रतानैर्यास्ता लताः परिकीर्तिताः ।
बहुस्तम्बा विटपिनो ये ते गुल्माः प्रकीर्तिताः।।

वृक्षायुर्वेदः - २७१-२७३
(Vrikshayurveda 271-273)

Plants are four types;

1. Herbs.
2. Trees.
3. Creepers.
4. Shrubs.

The plants that bear fruits without flowers are called Vanaspati (herbs), and those that bear fruits after flowering are called druma (trees).
Those that develop tendrils are called Lata (creepers) and those bushy with many branches are called as Gulmah (shrubs).

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BOTANY

OSMOSIS

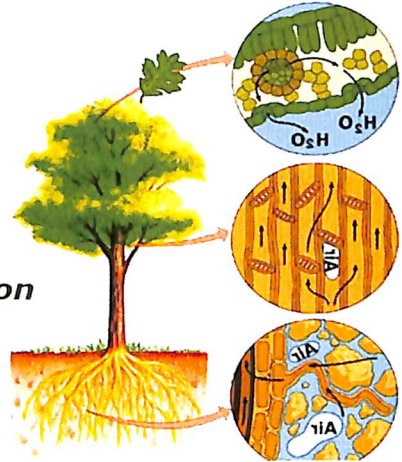
वक्त्रेणोत्पलनालेन यथोर्ध्वं जलमाददेत्।
तथा पवनसंयुक्तः पादैः पिबति पादपः।।

महाभारत-शान्तिपर्व, अध्यायः १८४, श्लोकः १६

(Mahabharata Shantiparva 184.16)
(3000 BC)

As one draws water up with the mouth (by suction) through a lotus stalk, The plant, endowed with air (pressure) drinks with its feet.

Due to rapid evaporation of water from leaves during transpiration, a tension is created and transmitted to the the xylem of the

roots, causing the water to cross cell wall and rise upwards.

The knowledge of osmosis in (Maha)Bharat - 3000 BC
Osmosis theory discovered by Kramer - 1969 AD

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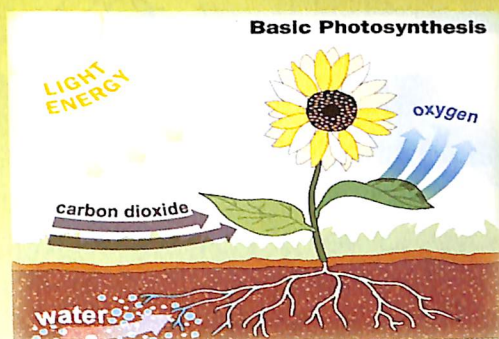
Photosynthesis

तेन तज्जलमादत्तं जरयत्यग्निमारुतौ।
आहारपरिणामाच्च स्नेहो वृद्धिश्च जायते।।

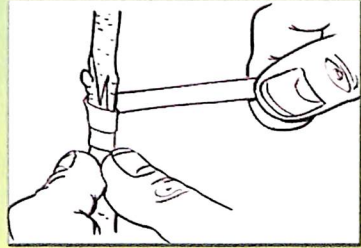
Mahabharata, Shantiparva, Adhyaya 184-18.

Water is drawn by the roots, it reacts with heat (light) and air of the atmosphere and the combinations of water, air and heat (light) makes the body fluid.

The fact is self explanatory,
Shows how daylight is a factory!
Courtesy, our ancient glory!!

Grafting

अजातशाखान् शिशिरे
जातशाखान् हिमागमे ।
वर्षागमे च सुस्कन्धान्
यथा दिक्स्थान् प्ररोपयेत् ॥

Brihatsamhita
505AD

बृहत्संहिता(५५-६)
वराहमिहिरः(इ.स.५०५)

(The grafting) should be done in the spring season (February-March) for those plants which have not yet got branches, in the winter season (December-January) for those that have grown branches and in the rainy season (August-September) for those that have large branches, in the proper direction. (The particular direction of the tree that is cut off should be kept up in grafting)

That is how to gain the best of both plan(e)ts!

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BOTANY

Tree Care

कीटजग्धेऽग्निसंप्लुष्टे वातभग्नेऽशनिपाते।
वृक्षच्छेदापचारादि-पीडितेऽपि पृथक्क्रिया।
कीटरोगाण्वादिबाधे अग्निसम्प्लुष्टोक्त-
वाताशनिपाताद्याघातेकुठारादिना
छेदे च वृक्षस्यरोगः भवति।
एकैकस्यापितदनुसृता चिकित्सा विधेया।।

VRIKSHAYURVEDA - 90

(When) eaten by insects, burnt by fire, broken by strong winds, hit by lightning and injured by cut, trees are affected and those parts are to be separated and should be treated accordingly.

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BOTANY

Treatment Of Trees

उन्निद्रता मत्स्यसगन्धिता च
प्रवालहानिः सपिपीलिकत्वम् ।
त्वग्भ्रंशनाद्-वारिकृतादजीर्णात्
तरोर्भवेत्तत्र चिकित्सनीयम् ।।

उपवनविनोदः १९१
UPAVANAVINODA -191

If a tree has the symptoms of---

- Always pale
- Smell of fish
- Devoid of leaves
- Full of ants

- Devoid of barks at some places and
- Incapability to digest water,

it requires treatment.

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Tridoshas of trees

नराणामिव वृक्षाणां वातपित्तकफाद्गदाः ।
सम्भवन्ति निरूप्यातः कुर्यात्तद्दोषनाशनम् ।।

उपवनविनोदः १७५

(Upavana-vinoda 175)
(13th century AD)

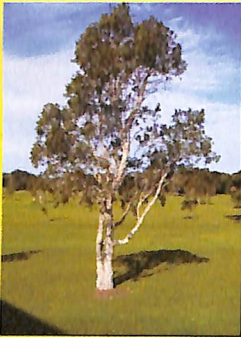
Trees, like men, get diseases through the vitiations of Vata, pitta and kapha - the three humours. One should diagnose and cure the diseases.

The vitiation of the three humours affects the trees just as humans. This was well observed.

Kapha-Natured-Trees

स्निग्धशाखादलशाखी सम्यक्
पुष्पफलोज्जवलः ।
लतापारीतगात्रस्तु कफवान्
परिमण्डलः ।।

उपवनविनोदः १७९
(13th century C.E.)

Trees of Kapha (phlegmatic) nature have their branches and leaves glossy; flowers and fruits well shaped and of good appearance, trunks symmetrical, and all parts covered with creepers.

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Vata-natured Plants

कृशदीर्घो लघुरुक्षो निद्राहीनोऽल्पचेतनः ।
न धत्ते फलपुष्पाणि वातप्रकृतिकस्तरुः ।।

उपवनविनोदः १७७
UPAVANAVINODA - 177

Thin and tall, short and shining, not dull, with a little vigour and not bearing fruits and flowers, such trees are of Vata type.

The trees were also divided into vata, kapha and pitta varieties just like humans.

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Plants respond to Light

वृक्षादीनां चेतनत्वं बोद्धव्यं तथा हि।
सूर्यभक्त्या सूर्यभ्रमण-दिक्सारिभ्रमणेन दृक्।।

चरकसंहिता (चि.सि ३००)
(Charaka-samhita)
(300 BC)

The consciousness in the trees can be understood by observing that they orient themselves according to the movement of the Sun (light).

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TREES CAN SEE

वल्ली वेष्टयते वृक्षं सर्वतश्चैव गच्छति।
नाप्यदृष्टेश्च मार्गोऽस्ति तस्मात् पश्यन्ति पादपाः।।

महाभारतम् - शान्तिपर्व -१८४-१३

(Mahabharata Shantiparva 184.13)
(3000 BC)

The creeper moves about the tree trunks, covering it all arround.Thre is no path for the one without sight. Hence creeper can see.

Many aspects of plant life are yet to be studied by mordern science. These facts are propounded by our forefathers ages before.

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BOTANY

Trees respond to Smell

पुण्यापुण्यैस्तथा गन्धैर्धूपैश्च विविधैरपि।
अरोगाः पुष्पिताः सन्ति
तस्माज्जिघ्रन्ति पादपाः।।

(Mahabharata Shantiparva 184.14) (3000 BC)

When covered with incense and smoke (gases) the trees become disease-free and flower (and fructify) aplenty. Hence they respond to gases.

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TREES CAN HEAR

वाय्वग्न्यानिनिष्पेषैः
फलं पुष्पं विशीर्यते।
श्रोत्रेण गृह्यते शब्दस्तेन
शृण्वन्ति पादपाः।।

MAHABHARATAM SANTHIPARV 172.12

By the sound of wind, fire and lightning, the fruit and flower perish.Sound is perceived by the ear, hence trees hear.

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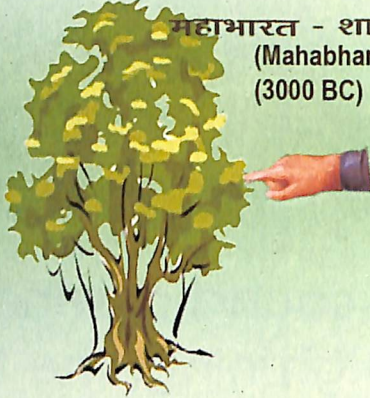
BOTANY

Trees have the sense of touch

ऊष्मतो म्लायते वर्णं
त्वक्फलं पुष्पमेव वा ।
म्लायते शीर्यते चापि
स्पर्शस्तेनात्र विद्यते ।।

महाभारत - शान्तिपर्व, १८४-१३
(Mahabharata Shantiparva 184.13)
(3000 BC)

The heat(rays of the sun) discolours the barks, leaves and flowers of trees. Since they also fade and perish (due to heat), trees have the sense of touch.

The nature was closely studied and documented so meticulosly thousands of years ago.

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BOTANY

CONSCIOUSNESS IN TREES

तमसा बहुरूपेण वेष्टिताः कर्महेतुना।
अन्तःसंज्ञा भवन्त्येते सुखदुःखसमन्विताः।।

(Manusmriti 1.49)

These (trees) are rendered immobile given to their nature of birth. (Yet) they are conscious and experience joys & sorrows.

Trees are not free!
from the consciousness-spree!!

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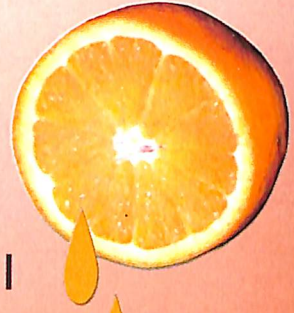
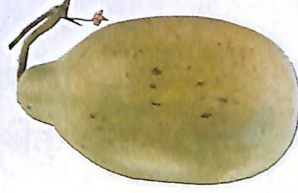
SEEDLESS FRUITS

मधुयष्टिसिताकुष्ठं
मधुपुष्पविनिर्मितैः।
मोदकैश्छादिते मूले
निरस्थि स्यात् फलं तरोः।।

(Upavanavinoda)
(13th century AD)

A paste prepared out of madhuyashti, sugar, kushtam, madhupushpam together applied to the root of a tree produces seedless fruits.

SEEDLESS VEGETABLES

कुष्माण्डवार्ताकपटोलकादि बीजं
वसाभावितमुप्तसिक्तम्।
विोधितायां भुवि सर्वकालं
फलान्यनस्थीनि महान्ति धत्ते।।

(Upavana-vinoda)
(13th century AD)

If the seed of gourd, bringal, patola and such other plants be treated with animal fat and then sown in purified (prepared) ground, and water be sprinkled over them, the fruits that grow out of them become big and seedless.

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Pesticides

करञ्जार्मवधारिष्ट-सप्तपर्णात्वचा कृतः।
उपचारः कृमिहरो मूत्र-मुस्त-विडङ्गवान्।।

उपवनविनोदः १८४
UPAVANVINODA 184

Worms are destroyed by the application of the following substances made into a paste with the urine of cow with *Vidanga* and *musta*

1. The bark of *Karanja*.
2. The bark of *Armavadha*
3. The bark *Arishta*
4. The bark *Saptaparna*

"Pest? No need to panic .. Go Organic!"

ART OF RAIN MAKING

हिरण्यकेशो रजसो विसारेऽहिर्धुनिर्वात इव ध्रजीमान् ।

शुचिभ्राजा उषसो न वेदा यशस्वतीरपस्युवो न सत्याः।।

(TAITTARIYA SAMHITA 3.1.11.4) तैत्तिरीयसंहिता -३.१.११.४

सोऽयं पुनर्नवजन्यो धूमः हिरण्यकेशः अग्निकेशस्थानीया ज्वाला येन धूमेन सहोत्पद्यन्ते । रजसो मेघरूपस्य विसारे प्रसरणे यथा वायुः कम्पमानः शीघ्रगतियुक्तः तद्वदयं मेघात्मासोऽयमीदृशो धूमोऽस्मदर्थं वृष्टिम् उत्पादयतु उषसो न वेदा सूर्योदयो यथा न ज्ञायते तथा मेघसमृद्धिरस्तु इत्यर्थः ।

(Saayana-bhashyam)

सायणभाष्यम् ।

THE TWIGS OF PUNARNAVA ARE OFFERED IN THE AHAVANIYA FIRE AND THE RESULTING SMOKE IS CONSECRATED WITH THE MANTRA, HIRANYA KESHO RAJASO... IT MEANS THAT THE SMOKE OF PUNARNAVA BELLOWING OUT ALONG WITH THE GOLDEN FLAMES REACHES THE CLOUDS QUICKLY AND PRODUCES SUCH A HEAVY RAIN THAT EVEN THE SUN RISE WILL NOT BE VISIBLE DUE TO THE DENSE COVERAGE OF BLACK CLOUDS.

UP IN SMOKE GOES THE UNDUE CREDIT TO MODERN SCIENCE FOR RAIN-MAKING. THE VEDAS HAD ALREADY DONE IT.

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AMOUNT OF RAINFALL FOR DIFFERENT TYPES OF SOILS

षोडशद्रोणं जाङ्गलानाम्

वर्षप्रमाणमध्यर्धमनूपानाम्

देशवापानामर्धत्रयोदशाश्मकानाम्

त्रयोविंशतिरवन्तीनाम् अमितमपरान्तानाम्

हैमन्यानां कुल्यावापानां च कालतः।

(ARTHASHASTRAM 2.24) (400 BC) कौटिल्य-अर्थशास्त्रम् -२.२४ (400 B.C.E.)

The amount of rainfall preferable for different types of soils:

1. *Jangala* (Arid)	16 *Drona* = 102.4cm.
2. *Anupa* (Marshy)	24 *Drona* =153.6cm.
3. *Ashmaka* (Stony)	13.5 *Drona* = 86.4cm.
4. *Avanti* (Plains)	23 *Drona* = 147.2cm.
5. *Aparanta* (Coastal)	Unlimited
6. *Himavat* (Foothills of the *Himalayas* and the places where irrigation canals exist)	Amount is immaterial

*1 *Drona* = 6.4 cm.

VARAHAMIHIRA DERIVED DRONA AND ITS SMALLER UNITS SUCH AS ADHAKA, PALA TO MEASURE RAIN.

GUPTA AND MAURYAN EMPERORS POPULARIZED IT.

Arid

Plains

Marshy

Coastal

Stony

Foothills

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THE FINE-TIMING OF SOW-TIME

वैशाखे वपनं श्रेष्ठं ज्येष्ठे तु मध्यमं स्मृतम्।
आषाढे चाधमं प्रोक्तं श्रावणे चाधमाधमम्।।१६८।।

रोपणार्थं तु बीजानां शुचौ वपनमुत्तमम्।
श्रावणे चाधमं प्रोक्तं भाद्रे चैवाधमाधमम्।। १६९।।

वृषान्ते मिथुनादा च त्रीण्यहानि रजस्वला।
बीजं न वापयेत्तत्र जनः पापाद्विनश्यति।। १७५।।

(KRISHI-PARAASHARA) कृषिपराशरः

SOWING IN VAISHAKA (MAY) IS STATED TO BE THE BEST; IN JYESHTHA (JUNE) MEDIOCRE AND IN ASHADHA (JULY) BAD AND IN SHRAVANA (AUGUST) THE WORST. IT IS EXCELLENT TO SOW SEEDS IN HOT SEASON (APRIL -MAY) FOR TRANSPLANTATION. SOWING IN SHRAVANA IS SAID TO BE BAD AND BHADRAPADA (SEPTEMBER) THE WORST. THE END OF JYESHTHA AND THE BEGINNING OF ASHADHA IS THE MENSTRUATION PERIOD. SEEDS MUST NOT BE SOWN DURING THIS PERIOD. THIS SAVES THE FARMER FROM REGRET.

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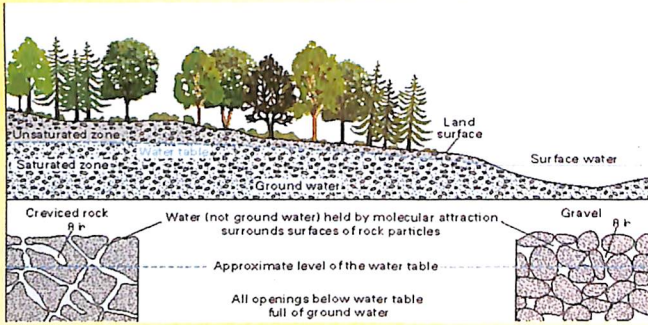
INDICATIONS OF GROUND WATER

स्निग्धाः प्रलम्बशाखा वामविकटद्रुमाः समीपजलाः।
सुषिरा जर्जरपत्राः रुक्षाश्च जलेन सन्त्यक्ताः।।

(BRIHAT-SAMHITA 54.49) बृहत्संहिता -५४.४९

THE TREES WHICH ARE SHORT AND WIDE, WITH LONG HANGING BRANCHES AND GLOSSY LEAVES INDICATE THE PRESENCE OF UNDERGROUND WATER NEARBY, WHEREAS TREES WHICH ARE HOLLOW AND DRY WITH PALE LEAVES INDICATE NONEXISTENCE OF UNDERGROUND WATER NEARBY.

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INDICATION OF GROUND WATER

सकुशासित-ऐशान्यां वल्मीको यत्र कोविदारस्य।
मध्ये तयोर्नरैरर्धपञ्चमैरतीयमक्षोभ्यम्।।
प्रथमे पुरुषे भुजगः कमलोदरसन्निभो मही रक्ता।
कुरुविन्दः पाषाणश्चिह्नान्येतानि वाच्यानि ।।

(BRIHAT-SAMHITA 54.27, 28) बृहत्संहिता-अ.५४-२७,२८

IF THERE IS AN ANTHILL COVERED BY KUSHA GRASS TO THE NORTHEAST OF THE MOUNTAIN - EBONY TREE; THERE WILL BE INEXHAUSTIBLE WATER AT A DEPTH OF 22½ CUBITS BETWEEN THE TREE AND ANTHILL. THE APPEARANCE OF A SNAKE OF THE COLOUR OF THE LOTUS-CALYX AT A DEPTH OF 5 CUBITS FROM A SURFACE LEVEL, FOLLOWED BY LAYERS OF RED EARTH AND RUBY INDICATE THE PRESENCE OF WATER.

SEED COLLECTION AND UPGRADATION

माघे वा फाल्गुने मासि सर्वबीजानि संहरेत् ।

शोषयेदातपे सम्यक् नैवाधो विनिधापयेत्।।१७५।।

(Krishi-paraashara) कृषिपराशरः

All sorts of seeds should be procured In Magha (February) or Phalguna (March) and should then be dried well in the sun. Do not sow them directly.

Only this remains to be done:
An upgradation of information about Bharat's excellence!

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TIME OF SOWING SEEDS

ततः प्रभूतोदकमल्पोदकं वा सस्यं वापयेत्।
शालि- व्रीहि -कोद्रव- तिल- प्रियङ्गु- दारक- वरकाः पूर्ववापाः।।
मुद्ग -माष- शैम्ब्याः मध्यवापाः।
कुसुम्भ-मसूर-कुलत्थ-यव-गोधूम-कलायातसी-सर्षपाः पश्चाद्वापाः।।

कौटिल्य-अर्थशास्त्रम् -२.२४

(Arthashastram 2.24)

Time of Sowing	Type of Seeds
1) First part of the rainy season.	Shali, Vreehi, Kodrava, Tila, Priyangu, Daraka and Varaka.
2) Middle Part of the rainy season.	Mudga, Maasha and Saimby.
3) Last Part of the rainy season.	Kusumbha, Masura, Kulattha,Yava, Godhuma, Kalaya, Atasi and Sarshapa.

Need the best yield ? Heed our forefathers....
Immense was their timing sense.

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WEEDING THE FIELD

निष्पन्नमपि यद्धान्यं न कृतं तृणवर्जितम् ।
न सम्यक् फलमाप्नोति तृणक्षीणा कृषिर्भवेत्।।
कुलीरभाद्रयोर्मध्ये यद्धान्यं निस्तृणं भवेत्।
तृणैरपि तु सम्पूर्णं तद्धान्यं द्विगुणं भवेत्।।

कृषिपराशरः १८९,१९०

(Krishi-parashara 189, 190)

Even a well-grown crop does not yield full returns if grass is not weeded out. Crop from which grass is weeded out in Shravana (August) and Bhadrapada (September) doubles itself later.

WEED THE FIELD & DOUBLE THE YIELD!!

Water Retention

आषाढे श्रावणे मासि धान्यमाकट्टयेद्‌बुधः ।
अनाकट्टं तु यद्धान्यं यथा बीजं तथैव हि ।।
कर्कटे कट्टयेद्धान्यमवृष्टौ कृषितत्परः।
भाद्रे चार्द्धफलप्राप्तिः फलाशा नैव चाश्विने ।।
न निम्नभूमौ धान्यस्य कुर्यात्कट्टनरोपणे।
न च सारप्रदानं तु तृणमात्रं तु शोधयेत्।।

कृषिपराशरः -१८६-१८८
(Krishi-parashara 186-188)

In Ashaada (July) or Shravana (August) the wise farmers construct small bunds for retaining water. If this is not done the seed will not germinate.

If rains are scanty, an attentive farmer constructs these bunds in sign of cancer (June) itself. If it is done in Bhadrapada (September) the crop is reduced to half the quantity. If done in Ashwina (October) there is no hope of returns whatsoever.

At lowlands, transplantation and manuring should not be done. Only weeding of grass is to be done.

Save water! By retaining our forefathers knowledge!!

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WATER DIVINING

अतृणे सतृणा यस्मिन् सतृणे तृणवर्जिता मही यत्र।
तस्मिन् शिरा प्रदिष्टा वक्तव्यं वा धनं चास्मिन्॥

बृहत्संहिता-५४.५२

(Brihatsamhita 54. 52)

If in a grassless place a patch of ground is seen covered with grass or in a grassy plot, a patch is seen devoid of it, a vein of water or a treasure is to be declared to exist there.

Perennial springs of Bhaarat's wisdom!

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RAIN FORECAST

उत्तिष्ठत्यण्डमादाय यदा चैव पिपीलिका।
भेकः शब्दायतेऽकस्मात् तदा वृष्टिर्भविष्यति।।

(Krishi-parashara 66) कृषिपराशरः -६६

Ants emerging (from the ant hill) carrying their eggs and a sudden croaking of frogs are also indications of sudden rains.

पक्षयोः शोषणं रौद्रे खगानामम्बुचारिणाम् ।
झिन्झीरवतस्थाकाशे सद्यो हि वर्षलक्षणम् ।।

(Krishi-parashara 70) कृषिपराशरः - ७०

Water birds drying their wings in the hot sun and crickets chirping in the sky also signify sudden rains.

Tiny were the hints ; mighty were the benefits ; mightier were our ancestors!

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MANAGEMENT OF AGRICULTURE

फलत्यवेक्षिता स्वर्णं दैन्यं सैवानवेक्षिता।
कृषिः कृषिपुराणज्ञ इत्युवाच पराशरः ।।

पितुरन्तः पुरं दद्यान्मातुर्दद्यान्महानसम्।
गोषु चात्मसमं दद्यात् स्वयमेव कृषिं व्रजेत्।।

गोहितः क्षेत्रगामी च कालज्ञो बीजतत्परः।
वितन्द्रः सर्वशस्याढ्यः कृषको नावसीदति।।

(Krishi-parashara 79, 81, 83) कृषिपराशरः -७९-८१,८३

"FARMS YIELD GOLD IF PROPERLY MANAGED BUT LEAD TO POVERTY IF NEGLECTED" SAID PARASARA, THE SAGE WELL VERSED IN THE SACRED SCIENCE OF AGRICULTURE.

AND SO DID THE OTHER SAGES: " MANAGEMENT OF ONE'S HAREM MAY BE ENTRUSTED TO ONE'S FATHER; THAT OF THE KITCHEN TO ONE'S MOTHER; CATTLE TO SOMEONE EQUAL IN STATUS. BUT FARMS SHOULD BE NEVER LEFT TO THE CARE OF ANY ONE OTHER THAN ONESELF.

AGRICULTURE, CATTLE, BUSINESS, WOMEN AND ROYAL FAMILIES, IF LEFT UNATTENDED EVEN FOR A SHORT WHILE, PERISH IN NO TIME.

AN AGRICULTURIST WHO LOOKS AFTER THE WELFARE OF HIS CATTLE, VISITS HIS FARM DAILY, HAS THE KNOWLEDGE OF THE SEASONS, IS CAREFUL ABOUT THE SEEDS, AND IS INDUSTRIOUS IS REWARDED WITH THE HARVEST OF ALL KINDS AND NEVER PERISHES.

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DRAINING OF WATER

नैरुज्यार्थं हि धान्यानां जलं भाद्रे विमोचयेत्।
मूलमात्रार्पितं तत्र कारयेज्जलरक्षणम्।।१९३।।
भाद्रे च जलसम्पूर्णं धान्यं विविधबाधकैः।
प्रपीडितं कृषाणानां न दत्ते फलमुत्तमम्।।१९४।।

Krishiparashara

WATER SHOULD BE DRAINED OFF FROM THE FIELD IN THE MONTH OF BHADRAPADA(SEPTEMBER) TO KEEP THE CROP DISEASE-FREE. WATER SUFFICIENT ONLY TO WET THE ROOTS SHOULD BE RETAINED.

IF CROPS ARE ALLOWED TO BE IN LARGE QUANTITIES OF WATER IN BHADRAPADA (SEPTEMBER) THEY ARE DAMAGED BY VARIOUS HARMFUL FACTORS DEPRIVING THE FARMER OF A GOOD HARVEST.

OUR FOREFATHERS KNEW HOW TO AVOID THE PROBLEM OF PLENTY

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Forestry

The ancient seers were curious in understanding the natural beauty & ruggedness of forestry. This has become part of the study of Vrikshayurveda.

Indian Epics, strongly based on episodes in forests, portrayed wildlife as holy. Saints led their life in ashrams made of leaves and meditated under the trees.

Ayurvedic medicine - developed through centuries of knowledge on the medicinal effects of plants - depends on forest trees & herbs to find cure for ailments. Ancient scholars educated and trained their younger generations at their homes situated in the forests.

ECOLOGY

Types of Forests

अकृष्यायां भूमौ पशुभ्यः विवीतानि प्रयच्छेत् ।
प्रदिष्टाभयस्थावरजङ्गमानि च ब्राह्मणेभ्यो
ब्रह्म-सोमारण्यानि तपोवनानि च
तपस्विभ्यो गोरुतपराणि प्रयच्छेत्।।
सर्वातिथिमृगंप्रयत्ने चान्यमृगवनं भूमिवशेन मा निवेशयेत्।
कुप्यप्रदिष्टानां च द्रव्याणाम् एकैकशो वा वनं निवेशयेत्।
द्रव्यवनकर्मान्तानटवीश्च द्रव्यवनापाश्रयाः।
प्रयन्ते हस्तिवनमटव्यारक्ष्यं निवेशयेत्।।

ARTHASHASTRAM 2.2

Types of Forests		Description
1	*Vivitam (Trinacvataha)*	Grassland for cattle.
2	*Brahmaranyam*	For the Brahmins to continue their studies.
3	*Somaranyam*	For sacrificial rites or where Soma is grown.
4	*Tapovanam*	Meant for ascetics.
5	*Mrigavanam*	Deer sanctuary.
6	*Vamshavanam*	For different families of trees like Devadaru.
7	*Dravyavanam*	To grow raw material for industries.
8	*Nagavanam*	Elephant sanctuary.
9	*Pakshivatah*	Bird sanctuary.
10	*Vyalavatah*	Sanctuary for wild animals.

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DESALINATION OF GROUND WATER

अञ्जनमुस्तोशिरैः सराजकोशातकामलकचूर्णः ।
कतकफलसमायुक्तैर्योगः कूपे प्रदातव्यः ।।
कलुषं कटुकं लवणं विरसं सलिलं यदि वाशुभगन्धि भवेत्।
तदनेन भवत्यमलं सुरसं सुसुगन्धि गुणैरपरैश्य युतम् ।।

(BRIHATSAMHITA 54. 121, 122)

HERBAL FORMULA FOR DESALINATION OF GROUND WATER IN THE DUG WELLS.

A MIXTURE OF **ANJANA, MUSHTA, USHIRA, RAJAKOSATAKA, AMALAKA** AND **KATAKA** IS ADDED INTO WELL WATER.

BY THIS EVEN THE MUDDY, BITTER, SALTY, BAD IN TASTE AND ODOUR WILL BECOME CLEAN, TASTY, AND ENDOWED WITH GOOD QUALITIES.

THIS SOLUTION DEFINITELY HOLDS WATER.

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Cosmetics

यथा तिलानामिह पुष्पसंश्रयात्
पृथक् पृथग्याति गुणोऽतिसौम्यताम्।
तथा नराणां भुवि भावितात्मना
यथाश्रयं सत्त्वगुणः प्रवर्तते।।

Mahabharatam,Shantiparva 298.13

As the same oil gets various fragrance when mixed with various flowers so does a human imbibes the good qualities with the good men he gets in touch with.

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Perfume

घनवालकशैलेयककर्पूरोशीरनागपुष्पाणि।
व्याघ्रनखस्पृक्कागुरुमदनकनखतगरधान्यानि।।
कर्चूरचोरमलयैः स्वेच्छापरिवर्तितैश्चतुर्भिरतः।
एकद्वित्रिचतुर्भिर्भागैर्गन्धार्णवो भवति।।

BRIHATSAMHITA 77.13,14

The various types of perfumes are prepared by mixing the following substances, every four of them permuted variously in 1,2,3or4parts:

- Ghana
- Valaka
- Saileya
- Karchura
- Ustra
- Nagapushpa
- Vyaghranakha
- Sprkk
- Aguru
- Madanaka
- Nakha
- Tagara
- Dhanya
- Kachura
- Choraka
- Chandana

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Music Instruments

वाद्यानि

चत्वारि वाद्यानि

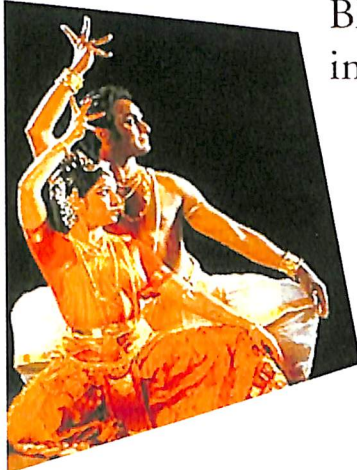
ततञ्चैवावनद्धं च घनं सुषिरमेव च।
चतुर्विधं तु विज्ञेयमातोद्यं लक्षणान्वितम्।।

(Natyashastram 28.1.1) नाट्यशास्त्रम् -28-1.1

ततं तन्त्रीगतं ज्ञेयम् अनवद्धं तु पौष्करम्।
घनस्तु तालो विज्ञेयः सुषिरो वंशः एव च।।

(Natyashastram 28.1.1.2) नाट्यशास्त्रम् -28-2

There are four type of musical instruments according to their nature--Tatam, the stringed; Avanaddham, the percussion; Ghanam, the cymbal (for rhythm); and Sushiram, the hollow(flute).

Bhartiya Music- Always imitated, Never Equalled!

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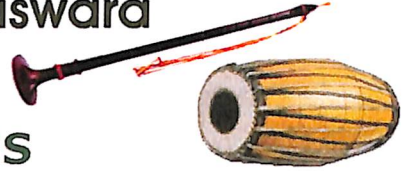
Sapthaswara

Sa Ri Ga ma pa dha Ni

THE 7 NOTES

श्रुतिभ्यः स्युः स्वराः षड्जर्षभगान्धारमध्यमाः।
पञ्चमो धैवतश्चाथ निषाध इति सप्त ते।।
तेषां संज्ञाः स-रि-ग-म-प-ध-नि इत्यपराः मताः।।

(Sangita-ratnakara 1.3.23,24)

The seven notes drawn from the Shruti are Shadjam, Rishabam, Gandharam, Madhyamam, Panchamam, Dhaivatam and Nishadam.
Their other (short) names are Sa, Ri, Ga, Ma, Pa, Dha and Ni.

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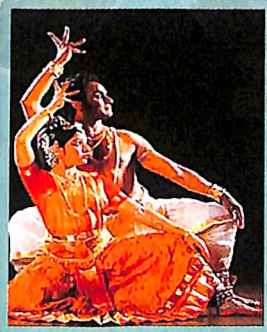
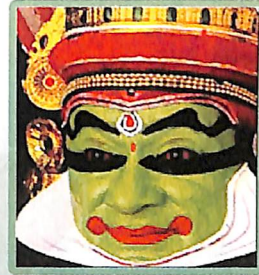
EXPRESSIONS

रसाः

शृङ्गारहास्यकरुणारौद्रवीरभयानकाः।
बीभत्साद्भुतशान्ताश्च नव नाट्ये रसाः स्मृताः।।

(Natyashastram 6.16)

The Nine rasas

- **Erotic**
- **Humour**
- **Pathos**
- **Anger**
- **Valour**
- **Fear**
- **Disgust**
- **Wonder**
- **Calmness**

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Art Of Painting

कलानां प्रवरं चित्रं धर्मकामार्थमोक्षदम्।
मङ्गल्यं परमं चैतद्गृहे यत्र प्रतिष्ठितम्।।
यथा सुमेरुः प्रवरो नगानां
यथाण्डजानां गरुडः प्रधानः।
यथा नराणां प्रवरः क्षितीश-
स्तथा कलानामिह चित्रकल्पः।।

वि.ध.चित्रसूत्रम् 43-38,39.
CHITRASUTRAM 43-38,39

The art of painting that bestows the four-fold objectives of human beings viz, Dharma (righteousness), Artha (wealth), Kama (desire) and Moksha (final beatitude) is best among all the arts. Houses with the display of excellent portrays are abode of auspiciousness.

As Sumeru is the best among mountains, Garuda among the birds, King amongst men, so is the art of painting amongst arts.

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Painting

शृङ्गारहास्यशान्ताख्या लेखनीया गृहेषु ते।

परिशेषाः न कर्तव्याः कदाचिदपि कस्यचित्।।

Chitrasutram 43-11

Picture portraying emotions such as romance, humour and peace can be painted and displayed in houses. Emotions other than these shall never be displayed in anyone's house.

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DHANURASANA

'DHANUH' MEANS BOW. DHANURASANA INCLUDES A DOWNWARD-FACING POSE. THE HANDS ARE BROUGHT BACK TO GRASP THE ANKLES. THE LEGS, CHEST & HEAD LIFT UP, GIVING THE FORMATION OF A STRETCHED BOW AIMED AT A TARGET.

THIS ASANA GIVES ONE A FOCUSSED VISION AND A POSITIVE OUTLOOK IN LIFE.

PRACTICE OF DIFFERENT POSTURES OF YOGA AND REGULATING THE BREATH INCREASE STRENGTH OF THE BODY & SWIFTNESS OF THE MIND AND REDUCES STRESS, COMPLEXITY, MENTAL TENSIONS, SENSITIVITE EMOTIONS & DEPRESSION.

JOIN YOGA !
BE FREE FROM ROGA !!
ENJOY AROGYA !!!

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KRIYAS, BANDHAS & MUDRAS

KRIYAS

The cleansing techniques in yoga are called Kriyas.
Some general cleansing techniques are:

1. Kapalabhati (Stimulating the brain cells)
2. Neti (Clearing the nasal passages)
3. Dhouti (Cleansing the intestinal tract upto the stomach)
4. Nauli (Control of the abdominal recta)
5. Trataka (Cleansing the eyes)

BANDHAS AND MUDRAS

Bandhas and Mudras are neuromuscular locks and gestures. Bandhas are safety locks used during the process of breath-holding-kumbhaka. These are advanced techniques in hatha yoga used for culturing of emotions.

Types of Bandhas

1. Uddiyana Bandha
2. Jalandhara Bandha and
3. Mula Bandha

Types of Mudras

Mudras are used in hatha yoga. According to Aheranda Samhita, there are mainly 25 mudras, whereas Hatha Pradipika describes only 10 of these excluding Yoga Mudra and Yoni Mudra. Among them twelve and the most important ones:

1. Maha Mudra (Royal gesture)
2. Maha Bandha
3. Maha Vedha
4. Yoga Mudra (Yoga gesture)
5. Viparitakarani
6. Vijroli
7. Sakticalani
8. Khecari Mudra
9. Yoni Mudra
10. Uddiyana Bandha
11. Jalandhara Bandha
12. Mula Bandha

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CARTOGRAPHY IN ANCIENT INDIA

The germinating period of geographical DOCUMENTATION begins with NADISUKTHA in RIGVEDA. (X.75)

Aitareya Brahmana (VIII. 14) accounts regional geography of Bharatam.

MAHABARATHAM (VI.11.12) BHUMI PARVA GIVES PHYSIOGRAPHICAL, CLIMATOLOGICAL AND METEOROLOGICAL DETAILS OF THE EARTH.

SHATAPATHA BRAHMANA (SB. 1.2.5.2-7) TRACES OLDEST INDIAN TERM OR SYNONYM OF MAP "VEDI" TO THE VEDIC PERIOD.

RIG VEDA (I.110.5) REFERS TO SURVEYING FIELD WITH MEASURING RODS.

MANUSMRITI (V11.255) PROVES THE EXISTENCE OF THE SYSTEM OF MAPPING AND DOCUMENTATION.

This clearly shows land was measured and boundaries were fixed or mapped on sheets in ancient Bharat.

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Vastu Shastra

दग्धैश्च मृण्मयैश्चापि लोहलोष्ठैर्यथोचितम्।
गोपानस्योपरिष्टात्तु छादनीयं विचक्षणैः।।
निश्छिद्रमिष्टमानेन विद्यातव्यं दृढं यथा।।

मयमतम् अ.18 ,108 (Mayamatam 18.108) (6th century AD)

ROASTED CLAY TILES OR SHEETS OF METAL CAN BE USED AS ROOF COVER FOR THE HOUSE WHICH SHOULD BE STRONG AND NON-POROUS.

VASTUSHASTRA RELATED BOOKS

1. Mrigashilpasamhita
2. Samutapunadhikaranam
3. Aryatatva
4. Vishwakarmaprakasha
5. Vishwakarmavidyaprakasa
6. Vishwakarmaprakasha
7. Vastuvidya
8. Aparajitapricha
9. Vastusara
10. Mayadipika
11. Mayamatam (Pratishthatantram)
12. Mayamatam (Shilpasastravidhanam)
13. Mayashastram
14. Mayashilpam
15. Mayasangraha
16. Narada Shilpasangraha)
17. Naradashilpam
18. Gargashilpasamhita
19. Shukraniti
20. Manasara
21. Grihavidhana
22. Pramanamanjari
23. Prasadamandana
24. Brihatsamhita
25. Vastuvidhana
26. Vastusaraprakarana
27. Shilpasarasangraha
28. Shilpachintamani
29. Shilparatnakara
30. Shilpasamirddhi
31. Rupamandana
32. Vastusara
33. Vastumanjari
34. Samaranganasutradhara
35. Manushyalayachandrika
36. Shilparatnam
37. Ishanagurudevapaddhatih
38. Vaikhanasagama
39. Krishnavastushastra
40. Jalargalashastra
41. Mayavastu
42. Vastusarvasva
43. Ratnakumaragrihavastu
44. Ratnakumarashilpasutram
45. Vasturajavallabha
46. Vastumuktavali
47. Vasturatnavali
48. Vasturatnakara
49. Vastusarani
50. Bhuvanadipika
51. Vastuprabandha
52. Vastumanikyaratnakara
53. Sudhalepavidhanam
54. Agamapuranam

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ARCHITECTURE

Brick-Making

एकवर्णसुखस्पर्शमिष्टं लोष्टेष्टकादिषु ।
मृत्खण्डं पूरयेदग्रे जानुदघ्ने जले ततः॥११६
आलोड्य मर्दयेत् पद्भ्यां चत्वारिंशत् पुनः पुनः।
क्षीरद्रुमकदम्बाम्राभयाक्ष-त्वग्जलैरपि॥११७
त्रिफलाम्बुभिरासिक्त्वा मर्दयेन्मासमात्रकम्।११८.५

Mayamatam, 15,114 - 118 (6th Century)

Clay bricks and tiles must be free from gravels, pebbles, roots and bones and must be soft to touch.
Fill the clods of clay in knee-deep water, then pound forty times with the feet.

After soaking in the sap of fig, *kadamba*, *mango*, *abhaya* and *aksha* and in the water of myrobalan for three months, pound (the clay).

The edifice of ancient Bhaarat's glory was built brick-by-brick , through excellence in field after field.

Land Evaluation

रत्निमात्रमधे गर्ते परीक्ष्य खातपूरणे।।
अधिके क्षयमाप्नोति न्यूने हानिं समे समम्।।

To evaluate land , soil should be tested by digging a pit of 1 arm length and refilling it with the soil excavated, If soil remains excess one will get prosperity and if less, loss results.

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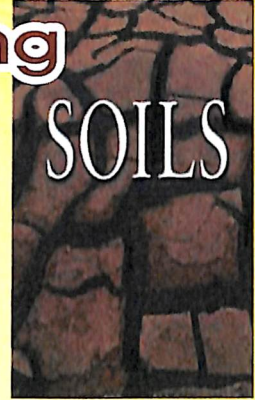
Soil Testing

पूर्वं भूमिं परिक्षेत पश्चात् वास्तु प्रकल्पयेत्।
वल्मीकेन समायुक्ता भूमिरस्थिगणैस्तु या।।
रन्ध्रयित्वा च भूर्वर्ज्या गतिधेश्च समन्विता।
वर्णगन्धरसाकारादिशव्दस्पर्शनैरपि।
परीक्षेव यथायोग्यं गृह्णीयाद् द्रव्यममुत्तमम्।।

First test the earth (site), then plan the construction. Land with anthills, skeletons, pits and craters should be avoided.

After examining the colour, smell, taste, shape, sound and touch (of the soil) buy the best material as found suitable.

Soils

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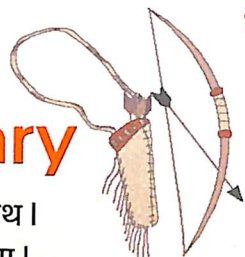
Appointment of a minister

जानपदोऽभिजातः स्वग्रहः कृतशिल्पश्चक्षुष्मान् प्राज्ञो
धारयिष्णुर्दक्षो वाग्मी प्रगल्भः प्रतिपत्तिमानुत्साहप्रभावयुक्तः।
क्लेशसहः शुचिर्मैत्री दृढभक्तिः शीलबलारोग्य-सत्वयुक्तः
स्तम्भचापल्यवरिजितः सम्प्रियो वैराणामकर्तेत्यमात्यसम्पत्।।

Arthashastram (1-9-1)

A native of the country, of noble birth, easy to hold in check, trained in the arts, possessed of the eye of (science), intelligent, persevering, dexterous, eloquent, bold, possessed of ready wit, endowed with energy and power, able to bear troubles,upright, friendly, firmly devoted, endowed with character, strength, health and spirit, devoid of stiffness & fickleness, amiable (and) not given to creating animosities – these are the excellences of a minister.

A good minister makes a good country. So the above guidelines given thousands of years before are applicable even today.

Weaponry

भिण्डर्द्वादशतालः स्यात् दश कुन्तो भवेदथ।
अष्टौ शतघ्नी शूलं च तोमरः शक्तिरेव वा।
अष्टतालं धनुर्ज्ञेय आवापोऽस्य द्विहस्तकः।।
शरो गदा च वज्रं च चतुष्तालं विधीयते ।
अङ्गुलानि त्वसिः कार्यश्चत्वारिंशत् पमाणतः।।
द्वादशाङ्गुलकं चक्रं ततोऽर्ध प्रास उच्यते।।

Shukraniti, senanirupanaprakaranam

The weapons are made according to the measurements of humans. This will enunciate following the requirements & measurements:

Bhinda (javelin) is of 12 talas
(a particular measure of height)
Kunta (lance) 10 talas
Shataghni (cylindrical wood with iron spikes) of 8 talas
Shoola (spear) of 8 talas
Tomara (iron javelin) of 8 talas
Shakti (spike) of 8 talas
Dhanu (bow) of 8 talas
Aavapa (sheath) of 2 cubits
Shara (arrow) of 4 talas
Gadaa (club) of 4 talas
Vajram (discus) of 4 talas
Asi (sword) of 40 angulas
Chakram (discus) of 12 angulas
Praasa (dart) of 4angulas

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वर्णानामुच्चारणम्

व्याघ्री यथा हरेत् पुत्रं दंष्ट्राभ्यां न च पीडयेत्।
भीता पतनभेदाभ्यां तद्वत् वर्णान् प्रयोजयेत्।।
(Paniniya Shiksha २७)

As a tigress carries her cub by her teeth with a balanced touch neither too gentle so that the cub might fall down, nor too harsh which might hurt the cub, so letters should be uttered.

शीक्षां व्याख्यास्यामः। वर्ण स्वरः। मात्रा बलम्। साम सन्तानः।
इत्युक्तश्शीक्षाध्यायः।

The aspects that constitute the science of pronunciation include Varna, Swara, Matra, Balam, Sama and santana.
(Taittiriyopanishad)

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KAPILAMUNI

KAPILMUNI, THE SON OF SAGE KARDAMA AND DEVAHUTI WAS A GREAT ASCETIC AND SIDDHA PURUSHA. HE IS RESPECTED AS THE PROPOUNDER OF SANKHYA SCHOOL OF INDIAN PHILOSOPHY. THE SANKHYA PRAVACHANA SUTRA AND SHASHTI TANTRA ARE HIS VALUABLE WORKS WHICH ADVOCATE A DUALISTIC CUM PLURALISTIC PHILOSOPHY. THIS PHILOSOPHY ADVOCATES THE EXISTENCE OF CHETANA PURUSHA AND PRAKRITI {NATURE}WITH SATTVA, RAJAS AND TAMAS AS ITS COMPONENTS.

ARYABHATTA

ARYABHATA, A GREAT SCHOLAR AND TEACHER OF ASTRONOMY, A MUCH RESPECTED PERSON OF HIS TIME WHO WROTE ARYABHATEEYAM. HE ALSO PROPOUNDED THE THEORY THAT THE EARTH REVOLVES AROUND THE SUN.

DHANVANTRI

DHANVANTARI IS THE GOD OF MEDICINE. HE IS SAID TO HAVE COME OUT WITH THE "AMRITA KALASHA" DURING THE CHURNING OF THE OCEAN AND BATTLE BETWEEN THE ASURAS AND THE DEVAS. WITH LORD VISHNU'S BLESSINGS, DHANVANTRI WAS REBORN IN THE DVAPARA YUGA AS "DHANVA" SON OF THE KING OF KASHI. EVERBODY PRAYED TO DHANVANTARI FOR A HEALTHY AND DISEASE-FREE LIFE.

VISHWAKARMA

VISHWAKARMA IS CONSIDERED TO BE THE FOREMOST ARCHITECT AND CRAFTSMAN OF THE CITIES OF DEVALOKA, THE MAKER OF THE SUDARSHANA CHAKRA OF LORD VISHNU, THE TRISHULA OF LORD SHIVA AND THE VAJRA OF INDRA. HE IS THE GRANDSON OF PRABHASA VASU AND THE SON OF MAHASATI YOGASIDDHA. HE HAD TWO SONS VISHWARUPA AND VRAJA WHO FOLLOWED THEIR FATHER. HINDU CRAFTSMEN CELEBRATE VISWAKARAMA JAYANTI WHICH OCCURS WHEN THE SIMHA RASI MOVES TO KANYA RASI.

RISHIS-SCIENTISTS

SUSHRUTA

THE FAMOUS SURGEON KNOWN TO HAVE PERFORMED THE PLASTIC SURGERY. HE AUTHORED THE FAMOUS BOOK -SUSHRUTA SAMHITA, A COMPENDIUM ON AYURVEDA, A TREATISE ON THE SCIENCE OF HEALTH &LONGEVITY.

THE SURGICAL INSTRUMENTS USED AND DEVELOPED BY HIM WITH A SCIENTIFIC CONSTITUTION EVOKE AWE & WONDER AMONG THE PRESENT-DAY SURGEONS.

NAGARJUNA

THE FAMOUS BUDDHIST PHILOSOPHER BORN IN VIDARBHA IN THE 2ND CENTURY AD.

HIS FAMOUS WORKS - MADHYAMIKA KARIKA AND VIGRAHA VYAVARTANI DEAL WITH THE PHILOSOPHY OF SHOONYAVAADA (NIHILISM), ACCORDING TO WHICH ATTAINMENT OF SHOONYATA IS NIRVANAM (ULTIMATE RELEASE FROM THE CYCLE OF BIRTH & DEATH).

HE WAS ALSO AN ERUDITE AYURVEDIC PHYSICIAN AND AN EXPERT IN CHEMISTRY.

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RISHIS-SCIENTISTS

BHASKARACHARYA

A great mathematician & astronomer of the 12th century AD.He was the head of the observatory at Ujjain. His famous works on mathematical astonomy include Siddhanta-shiromani & Karna-kutuhalam. The law of gravitation was propounded by him about 500 years before Newton.

VARAHAMIHIRA

A famous astronomer & a contemporary of Vikramaditya. He authored the famous book - Brihat-samhita. He was probably a resident of Ujjain & one among the 9 jewels in the court of king Vikramaditya.

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HERITAGE

THE VEDAS & THEIR EXPANSE

WHEN VYASA MAHARSHI DIVIDED & SYSTEMATIZED THE VEDAS 5000 YEARS AGO, AT THE END OF THE MAHABHARATA WAR, THERE WERE 4 VEDAS WITH 1131 RECENSIONS (SHAKAS).

THE RIGVEDA HAS 21 SHAKAS,
YAJURVEDA HAS 100 SHAKAS,
SAMAVEDA HAS 1000 SHAKAS &
ATHARVAVEDA HAS 11 SHAKAS.

A LOST HERITAGE

BUT NOW, THERE ARE TOTALLY ONLY 11 (OUT OF 1131) SHAKAS AVAILABLE!

1. FROM THE RIGVEDA, ONLY 2 SHAKAS (SHAKALA & SANKHYAYANA) AVAILABLE;
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Effects of 15 mts meditation Reading SamskritlReading Modern language

	Effects of meditation	Reading Samskrit	Reading modern language
EEG & Coherence	Increases	Increases	Decreases
Skin Conductance	Decreases	Decreases	Decreases
Heart Beat	Decreases	Decreases	Decreases
Breath Rate	Decreases	Decreases	Increases

This suggests that physiological state reached during practising meditation and active mental process integrated while reading Samskritam is similar.

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